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NATIVE ENGLISH SPEAKER REACTIONS TO ESL LEARNER ERRORS

by

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A THESIS

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ABSTRACT

The primary purpose of learning a second language is to enable the learner to communicate with speakers of that language. Any hinderance to this purpose, then deserves attention. When learning a second language, error making is unavoidable; in fact, it is integral to the learning process. However, errors can disrupt communication.

It is the purpose of this thesis to investigate the effect of various sorts of errors on communication. Certain errors may hinder communication directly by obscuring the meaning of a message. Other errors, while not affecting comprehensibility directly, may influence communication in other ways. If an error is noticeable to the receiver for reasons apart from comprehension, e.g., unacceptability, grammatical severity, irritation-provoking, it may disrupt the communication flow.

This study examines the reactions of ninety-two native English speakers to errors made by native Spanish speaking learners of English. To determine the different effects errors may have, two separate measures were used. The degree to which different errors affect *comprehension* was determined by means of an objective measure. The *affective reaction* which subjects had to errors was measured subjectively. The effect which the foreignness of an accent had on comprehensibility and affective reaction was also examined.

Eighty-four stimulus sentences were used to obtain the reactions. The sentences were made up from a corpus of natural language data. Two native speakers of Spanish with different degrees of foreign accent in their English pronunciation were contrasted to determine the effect of accent. The stimulus sentences each contained one of seven error types, (including errorfree and multiple error types) and were contextualized in an interview with a native English speaker. Thus, a natural language situation was simulated, which allows the results to be practically applied in the teaching of English as a Second Language.

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1. INTRODUCTION

1.1 The Role of Communication in the Second Language Classroom

In the learning of English as a second language (ESL), as with any non-native language acquisition, error making is unavoidable; it is expected. In a grammar-oriented approach, dealing with errors is more or less straightforward; errors are corrected. However, with the present emphasis on the communicative and functional aspects of language in the ESL classroom, just how to deal with learners' errors is not as clear as it was in more grammar-oriented approaches.

In the communicative approach the emphasis is on teaching the students how to communicate effectively rather than on the ability to produce grammatically correct utterances (Johnson, 1982). The goal of this approach is for students to achieve communicative competence. This implies a sociolinguistic competence; the ability to produce and understand language appropriately in terms of contextual factors (Canale, 1983). In essence this approach holds that grammatical competence - the ability to accurately understand and express meaning in language structure - is not sufficient to attain proficiency in a language. Although grammatical competence is part of communicative competence, sociolinguistic competence is important in attaining this goal (Canale, 1983). In the ESL classroom, then, students

are taught how to use language appropriately in a variety of realistic settings. They are provided with the tools necessary to understand and produce language in actual communication. The emphasis is more on meaning than on form.

Error correction, for the most part focuses on form. Thus, in the communicative approach error correction does not play a large role. The primary concerns are transference of meaning and appropriateness. So as to not impede the communication flow and inhibit the learner, his every error is not corrected. However, a technique of no correction cannot be used either; a certain amount of constructive error correction is needed to achieve the communicative goal. The instructor, then, must create a balance between allowing the student to communicate freely and exercise his language skills in a correction-free environment, and correcting those errors which are most important. Flexibility in error correction on the part of the teacher is needed in terms of when to focus on form and when to focus on meaning.

To determine which errors should be corrected, some distinctions need to be made among errors. Certain errors appear not to interfere with communication; in fact, due to the redundancy of the language system, certain errors can be made without obscuring comprehensibility. Thus, in terms of communicative goals, correction of these errors is unnecessary. Some errors, however, do block communication and, obviously, it is these errors which deserve correction.

Correction in these cases, in fact, is the byproduct of the need to understand, the need to aid communication. Other errors, while not impeding comprehensibility may still provoke some sort of negative reaction in the listener, and stigmatize the learner; these, also, deserve correction. The non-committal phrase *negative reaction* is used above to encompass a variety of responses possible when listening to an ESL learner, e.g., a reaction to the degree to which an error deviates from the standard grammar of the language, the effect which an error has on comprehension or irritation for other reasons. Presumably errors which fall into neither of the categories of irritators nor that of hinders of comprehension do not need correction in terms of communicative goals. Dividing errors into three categories-those which impede comprehension, those which provoke a more negative reaction, and others is perhaps overly simplified; however, in further research and experimentation, perhaps more refined divisions can be made.

1.2 Focus on the Dilemma

When to correct a student's errors may well be influenced by the individual student's motivation and personality; however, it is the hypothesis of this thesis that generalizations can be made as to which errors are more severe in terms of communication; as to which errors need to be corrected, and which errors do not.

Since a language learner's goal is to communicate with speakers of that language, i.e., native speakers, it should be the native speakers' concept of proficiency that the learners aspire to. To determine exactly what errors, or what types of errors need to be corrected and what errors do not, native speakers' judgements are the ultimate authority. The main purpose of discovering which errors made by English language learners obscure comprehensibility and which errors provoke a more negative reaction, perhaps regardless of their affect on comprehensibility, is a practical one. It will provide the ESL instructor (and the student) with a hierarchy of error importance, that is, a guide to which errors deserve correction and which aspects of language need more emphasis in teaching. In addition, it may provide insight into the process of communication and into language as an information code. In essence, it may suggest an explanation of why different errors have varying effects.

If we assume that language is, at least in terms of its functional value, a communication tool, those aspects which the language user attends to should be those which carry a higher information load. Errors which occur in those parts of language which do carry more information can be expected to interfere with the message more than those which affect less essential parts of an utterance.

Determining which parts of language carry a high information load is not straightforward, though. Given a sentence, it is easy to see that the content words, e.g.,

nouns and verbs, generally hold the essential message to a greater extent than do function words, e.g., prepositions. However, language cannot be viewed in such simplistic terms. Redundancy, complexity, and predictability, which are present in all languages, play a valid role in the transmission of information. The redundancy in language means that more information than is actually needed is represented. For example, articles are often redundant in English as the definiteness of a noun can be interpreted from the surrounding context. The role redundancy plays in language is that it protects the message from ambiguity and makes the utterance more noise resistant; that is, if anything interferes with the transmission of the message the receiver has more than one opportunity to receive the information (Beckmann, 1972). Redundancy also serves as a type of comprehension check. If a listener is uncertain of what he heard, a redundant element can serve to confirm the listeners assumption.

The complexity of language serves a similar but separate function. Essential, while perhaps rudimentary, information can be conveyed with the simplest and barest of language forms. A second language learner can in many instances communicate with a very small percentage of a native speaker's proficiency. The percentage of language the foreign speaker is missing, however, completes the language; that is, it provides comprehensive cues on a variety of levels. Subtleties of expression, emotions and the point of

view of the sender and/or receiver are often achieved by the complexity of language.

Thus, certain parts of a language that appear to have no practical significance at all may play an important role in information transmission. The 's' of the third person singular in the simple present tense in English does not offer any further subtlety of expression, neither does it carry anything more than redundant information. However, it has remained in the language. An error in this part of language could result in a hinderance of communication. If the subject of a sentence is *he*, *she* or *it*, an omission of the 's' would perhaps result in uncertainty as to the subject, i.e., the listener could assume the error rests in the choice of subject pronoun rather than in the verb form. In addition the information carried by a word or part of a sentence may not only pertain to that word or part. Language structure provides the hearer with a predictability capacity, so that a certain word or part of a sentence may dictate what will follow. Thus, the information load is higher on the predicting word or part and consequently lower on the predicted word or part.

Thus, the distribution of information in a sentence is dependent on many things. The redundant components in an utterance will play a role in information transmission if there is some interference. In English spoken with a foreign accent, which could be a type of interference, redundancy may play a large role in information carrying. A part of a

sentence may or may not carry much information depending on its predictive value. In addition to this, not all messages are of equal importance. They do not carry the same amount of information or have the same penalty if misunderstanding occurs. For example, the information content increases with the unexpectedness of an event (Beckmann, 1972).

By eliciting comprehension judgements on sentences uttered by foreign speakers that contain errors, perhaps a clearing understanding of how information is coded in language and what functions different parts of language play in communication will result. The effect that errors in different parts of language have in terms of communication may provide clues.

In view of the different roles that segments of language play, and the essentialness of most parts of language, the reasons behind comprehension or lack of comprehension become more complex than perhaps first thought. Determining just what the native speaker attends to in comprehending his own language as spoken by ESL speakers is one of the purposes of the study comprising this thesis.

Language ,however, is more than simply an information code. Judgements on language cannot be restricted only to whether an utterance is comprehensible or not. An utterance can transmit the desired message with no loss of information even of it is grammatically incorrect. Native speakers have an acquired knowledge of all aspects of their language; inherent in the acquisition process is a subsequent ability

to accurately judge the linguistic acceptability of instances of that language. The acceptability of an utterance must be separated from its comprehensibility. Although a sentence which is partially or totally incomprehensible is also unacceptable, the converse is not necessarily true. Acceptability depends on the structure or grammar, lexical choice and possibly style in addition to information transmission. More often than not the linguistic reasoning behind the acceptability judgement is subconscious. A native speaker of a language is rarely even aware of his own language's idiosyncracies. The native speaker's intuitive knowledge of degrees of acceptability must be considered and explained as well. The native speaker's intuitive knowledge of his language enables him to act as a competent judge of acceptable sentences in his language. These intuitions are, in fact, the ultimate judge when dealing with both descriptive and prescriptive grammars. Acceptability judgements are also included in this study, with the supposition that utterances judged to be less acceptable may have a negative effect on the hearer, resulting in irritation and less attentiveness and thus creating the possibility of a higher degree of miscomprehension. Such judgements could also stigmatize the learner. This study examines acceptability indirectly. Subjects are asked for affective reaction judgements. These judgements may be based on the acceptability of an utterance and/or a host of other possibilities, some of which have

been mentioned previously.

When in the position of interacting with a non-native speaker, a native speaker has the ability to judge the degrees of acceptability of the learner's utterances. How this ability is exercised is one of the primary topics to be discussed and examined in this thesis. In native/non-native interaction the emphasis is usually on comprehension, and this emphasis is often more pronounced than in native/native interaction. Thus, a certain amount of blindness or ignoring of language errors is both expected and necessary on the part of the native speaker: expected because a native speaker's command of the language entails that he is able to understand even if the entire message is not transmitted; necessary because attention to the errors and consequently less attention to the remainder of the utterance would result in loss of information. Anecdotally, the writer's own experience as an ESL instructor attests to this, as even in the midst of this research, a comprehensive list of errors made by current ESL students could not be given. Lack of comprehension certainly is evident, however, even though precisely what error caused the miscomprehension may not be clear. Attention cannot be given to the errors since it is the remainder of the utterance which will carry the message. In the tasks comprising the experimental component of this thesis the native speakers' judgements will be restricted to one sentence at a time. With this restriction of speech whether or not the subjects' natural blindness to errors

will persist remains to be seen.

1.3 Brief Outline of the Course of the Study

What is of concern, to refocus our attention on the study at hand, is finding out which errors obscure the meaning of an utterance, and which errors provoke some kind of negative reaction in the listener. The writer's hypothesis is that the criteria used in determining affective reaction judgements will vary interpersonally. Reasons may range from the degree to which the speaker's message can be understood (a direct correlation to the comprehensibility effect of the error), to the occurrence of minor errors which are not necessary for comprehensibility but are simplistic in their usage (i.e., that it is considered the learner *should* know).

The study will elicit judgements on comprehensibility and affective reaction separately. The two separate judgements will, however, be made on the same set of sentences. The resulting two sets of judgements on one set of stimuli will allow a comparison of the degree of comprehensibility and the affective reaction judgement. Such a comparison will determine whether listeners consider the degree of comprehensibility to be a factor in their affective reaction judgements or whether other factors are of more primary consideration.

2. LITERATURE REVIEW

2.1 An Introduction to Errors

Until recently errors made by language learners were seen as something to be avoided. Their presence signaled that the teaching process had somehow fallen short of its goal. Errors were avoided when at all possible by practice of the correct models a sufficient number of times (Brooks, 1960). Currently, in the field of second language acquisition and teaching errors are viewed much more favourably (Hendrickson, 1978). They are viewed as an integral part of the learning process. Errors are not welcomed or encouraged; however, their existence is accepted as unavoidable. Although the ultimate goal is nativelike, errorfree language, the errors made by second language learners offer insight into the language learning process. Errors, then, can be analysed for a number of purposes. In this study, errors are analysed for the purpose of discovering how native English speakers react to various types of errors made in their language by learners of ESL. Thus, the effect of different errors is examined rather than the errors themselves. Analyses of the errors themselves has been the approach more frequently taken. For the purpose of providing a more complete background to the study of errors, a brief summary of the primary historical approaches to error analysis follows.

2.2 Error Analysis

One of the early goals of the analysis of errors in second language acquisition was to discover the errors' sources. Contrastive analysis has dominated the field in this respect. In the strong version of this hypothesis it is stated that difficulties experienced by learners of a second language can be predicted from a systematic comparison of the phonological, grammatical and lexical components of the native language and the target language. This comparison provides a knowledge of the similarities and differences between the two languages, thus, teaching materials and techniques can be comprehensibly tailored to the students' specific needs. The weaker version of contrastive analysis, while holding to the same tenets, explains errors produced or difficulties experienced by students on the basis of a comparison between the native and the target languages rather than predicting what problems the learners will have. In both versions of the hypothesis, the assumption made is that the primary source of errors is interference from the native language.

Although interference is definitely a contributing factor, particularily in phonology (Hendrickson, 1978), it has been found that it is only one of a number of contributing factors and is not the dominating one. Although the learner certainly relates aspects of the target language to the frame of reference developed by his native language, a great number of errors are the result of assumptions made

on the basis of the target language system alone. It is suggested by some (Bailey, Madden and Krashen, (1974), and many others) that second language acquisition parallels first language acquisition in this respect. The child learns his mother tongue by techniques of trial and error and hypothesis testing based on generalizations made from other constructions in the target language. A learner's errors, then, are evidence that learning is taking place and they provide a window into the process of acquisition up to that point and highlight his specific areas of difficulty. Assuming that a main source of error stems from the learner's strategies of testing hypotheses about the language system, feedback on the correctness of those hypotheses is essential to the learning process. Correction of every error, however, even with an explanation attached, is unwise for reasons apart from learning strategies; psychology and personality factors play a role here.. Extensive use of a language is essential to its acquisition, and use in a natural, that is communicative, situation is vital. Constant correction creates an unnatural setting and may undermine a student's confidence, hindering his desire to use the language (Cohen, 1975). Thus, when, how, and what to correct are issues in this dichotomy of purpose, that is, providing correction when needed yet not hindering the student from using the language as much as possible.

2.3 Errors from the Native Speaker Perspective

Contrastive analysis and error analysis comprise the more traditional realm of the study of errors. With these methods, the yardstick to which language samples are compared is the standard grammars of languages. A small body of literature approaches errors from another perspective. These are the studies which examine native speakers' judgements and intuitions about errors made by foreign learners of their language. They are reviewed below.

While the more traditional approaches to error study deal with the dilemma on a somewhat theoretical level (although the findings can be practically applied), the judgement studies approach the problem on a practical level to begin with. How native speakers react to foreign learners of their language is not merely an experimental situation, it is an everyday reality. In exploring such situations it can be discovered what the functional qualities of language are, that is, what aspects are necessary for communication, and what the ramifications of various sorts of errors are. The body of literature dealing with the functional aspects of language, although not extensive, is not impoverished as it encompasses a number of different fields, e.g., sociology, linguistics, and psychology. The literature and experimentation dealing specifically with native speakers' reactions to foreign learners' errors is, however, limited. As there is not (yet) a tried and tested body of literature to draw upon, the approaches and methodologies are quite

diverse. Although the general goal of discovering which errors affect comprehensibility more and what other effects errors have is, for the most part, constant throughout all the studies, the specific aspect of language focused on and the way in which it is viewed varies. This results in the findings being, while not contradictory, fragmented. With all the findings grouped together, there is a good amount of confirmation of results and thus a basis to which additional results can be compared. Language can be examined on different levels, e.g., phonological, syntactic, and can be viewed from different perspectives (grammar versus vocabulary, noun phrase versus verb phrase, etc.); thus, the possibilities are numerous. Interestingly enough, thus far the findings reported in the literature, although derived from a number of different approaches and perspectives, are not contradictory, and in fact, for the most part, support one another. This suggests that, although native speakers' judgements are individual and intuitive, there is a definite measure of conformity and consistency in these judgements.

Johansson (1978, 1975) discusses subjective versus objective measures of errors. His discussion is based on Greenbaum and Quirk's (1972) discussion. Because of the nature of studies dealing with native speakers' judgements, the possibility of personal bias seems quite evident. An objective measure of error gravity consists of an indirect method of obtaining the judgement, while a subjective measure consists basically of requesting the actual

judgement. The methods used by Guntermann (1978) and Piazza (1977), illustrate the two approaches. In Guntermann's study the subjects were required to listen to samples of foreign language learners' speech and restate the sentences according to what they thought the speaker was trying to say. In this objective type of measure, the subject may not even have been aware of what errors were present or which had been corrected in the restatement. Piazza obtained judgements more directly by simply asking for a rating (0%, 25%, 50%, 75%, 100%) of the intelligibility/irritation of the utterances containing errors. In this case, the subject made a conscious judgement of a specific error. All the studies which objectively measured error gravity used a technique similar to the one described above. Margret Olsson (1977) lists the four types of responses received in her study of this type: (1) repeating the utterance heard; (2) changing it to a reproduction of the intended sentence; (3) omitting to respond; (4) imposing a non-intended interpretation on the utterance. The problems associated with an objective measure are evident. In a sense the subject error is increased in attempting to obtain an objective or unbiased judgement of a specific error or group of errors by indirectly tapping the subject's intuition. However, since the subjects were not specifically asked to correct the error, alternative responses, i.e., unwanted responses, are unavoidable. The writer's preliminary experimentation revealed this exact dilemma. Some of

Johansson's studies (1975, 1978) state much more specific instructions, directing the subjects to correct any errors a sentence may contain. He makes no reference to invalid subject responses; however, the explicitness of his instructions most likely preclude the variation of response received by Olsson. In a sense this method of objective measure is an attempt to simulate a native speaker's natural response when exposed to an erroneous utterance. It is assumed that while the native speaker comprehends the intended message, a mental note, perhaps even subconscious, is made of the error. In view of this, the subjective measures used by Chastain (1980, 1981), Piazza (1980), Politzer (1978) and Johansson in a number of his studies (1975) are decidedly unnatural. The premise is not the same, however. In making subjective judgements the subjects are asked to overtly state their intuitive judgements. In asking the subjects to rate sentences containing errors on a continuous scale (Piazza, 1980; Johansson, 1975), to make discrete judgements such as in Chastain's studies(comprehensible and acceptable, comprehensible but unacceptable, incomprehensible), or to rank order sentences according to the amount of deviance (Politzer, 1978; Johansson, 1975), the subjects intuitions about his language's grammatical rules are tapped. Johansson (1975) contrasted these two types of measure. He administered both subjective and objective measures of error gravity using the same corpus of errors. The results in these studies indicate

a consistent relationship between subjective and objective meaasures of error severity. Johansson suggests that this could be taken as an indication that the native speaker, in the course of using his language, has developed a consistent intuitive sense of communicative efficiency. It then seems highly likely that, given the confirmation of a consistent intuitive ability to judge errors, the choice of testing technique to elicit judgements is arbitrary (Johansson, 1975). In reviewing the literature pertaining to native speakers' judgements, the finding that the testing technique does not bias the results allows the results to be viewed as a whole.

In terms of the different measures used to elicit judgements, the results from various studies can be combined. However, there is not a great deal of conformity as to how the language data, either stimuli or responses, are segmented. Politzer (1978), for instance contrasts errors of word and form in verb phrases and noun phrases. Other authors simply concentrated on errors most frequently made by learners. Johansson (1975), for example, contrasts word order, concord and verb complementation errors made by Swedish learners of English. Thus, in terms of drawing conclusions about what specific errors hinder communication or provoke a negative reaction in the listener, the results are not comparable. Because of the different ways in which the data are analysed it is difficult to discern general tendencies.

In the parts of these studies which deal with comprehension, phonology is either controlled for, as in Piazza's study (1980) involving French as a second language, where the same speaker read all the stimuli, or it is irrelavant as in studies involving only written stimuli and responses (Chastain, 1980, 1981). Other studies included pronunciation as a variable (Galloway, 1970; Politzer, 1978). Johansson has specifically looked at pronunciation or accent in a number of his studies (1975). Galloway found that subjects were not greatly disturbed by a non-native speaker's pronunciation or accent in terms of a subjective reaction. In Politzer's study pronunciation ranked in less severe end of scale. Johansson, contrasting native and non-native speakers, found that the comprehensibility gap between these two groups was rather small.

The effect of errors on comprehensibility is the main focus of most of the studies done. The degree to which different errors irritate the hearer or the hearer's judgements of the acceptability of errors, are also main areas of investigation. What is considered to constitute irritation varies from study to study, however, which leaves on even greater area for further research. Johansson and Piazza consider the level of irritation with an error to correspond to its severity in terms of communication. This assumption is certainly valid, although possibly not a sufficient explanation. In many cases if a language learner's errors interfere with communication there is

frustration on the part of the speaker and the listener which can result in the listener becoming irritated. However, the learner's difficulties could also make the listener more sympathetic. A number of other researchers have added a further dimension to this aspect of the studies. Chastain (1980) suggests that native speakers may become irritated by errors, even if they do not interfere with communication, depending on the subjects' linguistic tolerance, insight, interest and patience. Piazza also proposes that an error that does not interfere with communication may still irritate the listener. In their studies involving native speakers of Spanish, both Galloway (1978) and Guntermann (1978) stressed the separateness of errors causing incomprehensibility and errors which may irritate the listener. Guntermann suggests that errors which do not impede communication may still bar the learner from acceptance into social and personal relationships with members of the foreign language community as his/her errors may result in stereotyped negative judgements (also Galloway, 1978).

It is interesting to look at these different presuppositions as to what constitutes errors causing irritation in terms of the native language groups being examined. The four studies involving native Spanish speakers (Chastain, 1980, 1981; Galloway, 1978; Guntermann, 1978) suggest that there are errors which may produce negative reactions in listeners even though these errors may not

hinder comprehension. Piazza (1977) in her study of native French speakers alludes to the existance of errors which may irritate the listener while not impeding communication. In Politzer's study (1978) involving native speakers of German, no mention is made of an irritation factor. Finally, in Johansson's studies involving native speakers of English irritation is equated with the errors' bearing on comprehension.

2.4 Studies Pertaining Specifically to Native English Speaker Reactions

The majority of studies concerned with English, that is, studies which involve judgements made by native English speakers have been done in Sweden, and thus involve Swedish learners of English. Johansson's work (1975, 1978) consists of numerous studies focusing on different areas, e.g., phonology or grammar. Olsson's study (1977) is very specific in topic in that it deals only with the passive construction in English; however, its results can perhaps have quite general applications.

Perhaps the most widespread finding, a result of both Johansson's and Olsson's studies, is that lexical errors seem to hinder comprehension more than grammatical errors. These results further confirm the same finding in Engh's earlier study (1971, in Johansson, 1978). In Johansson's discussion of this result he suggests that this is due to lexical items belonging to an open class and thus comprising

the idiosyncratic, unpredictable aspect of language. Since grammatical choices belong to a closed class, it is rule-governed and predictable; a grammatical error is easier to interprete correctly since the choices of what might have been intended are fewer. An error involving a lexical item, however, is not as likely to be interpreted correctly since the possible or plausible choices are more numerous. Olsson's working definition of intelligibility is the extent to which the intended interpretation is preferred to an alternative interpretation. Thus, the more serious the error, the less likely the intended interpretation will be arrived at. Olsson's findings do not explicitly support the previously mentioned researchers' findings that lexical errors are more severe than grammatical errors. However, her findings certainly support this implicitly. She found that in rewording an utterance, subjects preferred to keep the grammatical subject phrase intact, that is, they adopted an interpretation which retained the subject of the stimulus sentence. They preferred reinterpretation of an utterance to deleting words in an utterance. In determining the intention of the sentence the noun, and more specifically the subject noun, was of primary importance. Thus, it appears the choice of lexical items determines the interpretation of an utterance more than the grammar. Therefore, if an erroneous choice is made by the speaker, it is likely to be accepted as the intended interpretation. Hence, it is more possible for a lexical error to be simply accepted as the intended

choice, rather than relying on the grammar to supply the intended interpretation. A lexical error is thus more likely to result in an impedance of communication. Olsson also found that the most marked member of the noun phrase-verb phrase relationship in a neutral context determined which interpretation was chosen. For example, the stimulus sentence *where are my book* would more likely be interpreted as *where are my books* than *where is my book*. In a sense this could also be viewed as the lexical items taking precedence over the interpretation since *is* and *are*, because of their irregularity could be viewed as lexical rather than grammatical alternatives.

These studies have also found that a greater number of errors per utterance is more likely to result in misinterpretation.

Johansson's studies focus on different types of grammatical errors. In his study in which errors in verb complementation, verb agreement and word order were contrasted, word order errors were found to be the least severe in terms of acceptability and the other two were, for the most part, equal. Why this is so is not immediately obvious. In English word order is quite strict; therefore, it would make more immediate sense for word order errors to be the more severe. However, viewed in conjunction with the findings concerning lexical items, a plausible explanation can be put forth. If it is assumed that language processing consists of the listener processing major constituents or

components first, such as word order and lexical items, and resorting to finer syntactic and grammatical relations only when necessary, even if the word order is incorrect, or a lexical choice is erroneous, these are accepted as given, i.e., without their correctness questioned. As discussed above, grammatical correctness is easier to define; there is not much margin for error.

2.5 Results with Native Speakers of Languages Other than English

A number of studies have focused on the judgements of native speakers of Spanish. Chastain (1980, 1982), Galloway (1978), and Guntermann (1978) made use of different methods to obtain judgements. Galloway's approach is more general; that is, she did not focus on specific error types but asked for overall impressions of videotaped presentations of speakers of Spanish as a second language. Her major finding was that an individual's lack of grammatical accuracy may not envoke negative reactions in listeners if an urgency and a desire to communicate are evident.

Chastain and Guntermann found that most errors in grammar did not impede communication to a significant extent; a hierarchy could, however, still be established. In Guntermann's study the errors which resulted in more misinterpretations were substitutions of *ser/estar/haber* (the verb *to be* in English), errors in tense, the omission of verbs, and the omission of the conjuction *que (that)*. In

terms of errors in agreement, misagreements in person and number between verbs and their subjects caused the greatest miscomprehension. The most frequent errors made by Spanish learners, those of noun-modifier agreement and article omission, were accurately interpreted by all informants. It is difficult to compare these findings with Chastain's studies of Spanish since his discussion of the results is much more detailed. He found the relatively most serious errors in terms of communication were those of mode, wrong form of stem, the omission of pronouns and the misuse of infinitives in the verb phrase and the wrong use of a noun in the noun phrase. Although these results do not precisely confirm Guntermann's results, they are not contradictory.

In the verb phrase, the most acceptable errors were incorrect stem, misuse of/wrong noun, mistake in agreement and extra articles. The most acceptable errors in the noun phrase were adjective agreement and extra words.

Guntermann's findings in terms of acceptability focused on specific contrasts. She found that the omission of articles was more acceptable than errors in agreement between articles and nouns, and errors of person were less acceptable than errors in tense in verbs. Chastain (1980) suggested the general finding that errors involving words were more likely to impede communication than grammatical errors.

Both Chastain and Guntermann found that the errors that were unnoticed generally involved redundancies such as noun

modifier agreement, article omission, plural formation etc.. Comparing result for result there are a number of direct contradictions, such as errors in tense and the omission of *que* being severe in Guntermann's study yet going unnoticed in Chastain's. This is possibly due to the different emphasis and methodologies as mentioned above.

Piazza (1980) in her study of errors made by learners of French found a relationship between comprehension and irritation in that the less comprehensible the error made a sentence the more irritating that error was. Combining comprehensibility and irritation, the respondents showed the greatest tolerance for errors of verb form and pronouns. The hierarchies developed for irritation and comprehensibility were not identical, however, so the the relationship is not strictly a dependent one.

Politzer's (1978) study of the perception of errors in German revealed that vocabulary errors are definitely the most serious followed by verb morphology, word order, and gender confusion. His study involved paired comparison of a variety of errors, which differs most widely from other methodologies; however, his results do conform to those already presented.

2.6 General Conclusions

Whether generalizations across languages in terms of error severity can be made remains to be seen. However, even from the few studies done a pattern can perhaps be detected.

The most obvious pattern is that vocabulary errors impede communication more than grammatical errors. All the studies which varied the number of errors per sentence also agree on incomprehensiblity increasing as the number of errors increases.

These studies have all dealt with specific areas of native speakers' perceptions of errors. In this respect the writer's experimentation is no different. In the study reported in this thesis, in order to allow for valid comparison of error types, the most common and frequent errors made by a specific group of English learners (native Spanish speakers) were determined. Only syntactic, lexical and morphological errors were selected. By contrasting the most common and frequent errors, the resulting hierarchy of severity can be applied practically in the classroom. The corpus of errors collected is divided into categories in terms of levels on a morphological to semantic scale - inflections, function words, verb morphology, content words and major constituents. In a sense, these units correspond to the progression of accuracy as a learner becomes more proficient; they loosely correspond to learning stages in ESL acquisition. For example, an adequate vocabulary is often acquired before simple inflections, such as the plural marking 's'. These error types, each with specific errors, were compared with each other. The two major findings of previous studies - vocabulary errors being more severe than grammatical errors and multiple errors disrupting

communication - received special attention. The effect of number of errors per sentence was also included because one error per sentence is not guaranteed in natural communication. Errors in phonology were not examined per se. The effect of accent was controlled in that the ESL speakers share the same first language background. The affect of accent is, however, manipulated to the extent that the Spanish speakers' pronunciation of English varied in terms of its nativelikeness.

The studies done previously have varied greatly in their methods of obtaining irritation, or affective reaction judgements, and in their findings in this area. In this domain, the main concern of this study is to ascertain whether there is a correspondence between affective judgements and comprehensibility, as Piazza suggests, or whether they are separate issues as Guntermann suggests. For this reason the same stimulus sentences were used for both judgements; however, the judgements were requested separately. In order to compare and control for specific error types, stimulus sentences were devised based on natural language data. However, since much of comprehensibility depends on context, the sentences were contextualized in presentation. It was hoped that this would allow for comparison of a finite set of errors (not possible in free flow conversation) while simulating contextual and natural speech.

In terms of the writer's search for which errors obscure meaning, and which errors provoke negative reactions, three alternatives, along with their combinations, are examined: error type, number of errors per utterance, and degree of deviance from native English pronunciation (i.e., accent). The sentences for scrutiny were contextualized in a typical question and answer situation with a native speaker. This contextualized stimulus material was presented orally since ESL learners are, for the most part, in contact with native speakers in a spoken informal environment. Thus, it was hoped that the presentation came close to replicating a natural language situation.

3. EXPERIMENTAL DESIGN

3.1 Purpose

The experimental work reported in this thesis is designed to test the effect of errors made by non-native speakers of English as perceived by native English speakers. These perceptions are tested in terms of two variables. The first variable, affective reaction, is tested by means of a subjective measure with the subjects simply being asked to determine and scale-rate their reactions. To test the second variable, comprehensibility, an objective measure is used. Instead of the subjects explicitly determining whether they understood or not, they were asked to record what they thought the speaker meant to say. From these records a comprehension score was determined.

The experiment is designed to answer four main sets of questions: 1) Which errors provoke a more negative reaction in listeners, and is there any similarity among errors which do/do not provoke a more negative reaction? 2) What effect do different errors have on comprehensibility, and is there any pattern among errors which do/do not hinder comprehensibility? 3) Is there a correlation between errors' effects on comprehensibility and their provocation of negative reaction? 4) Does the foreignness of a speaker's pronunciation affect comprehensibility or affective reaction judgements?

3.2 Stimuli

The error types examined in this experiment were selected from eight actual interviews with non-native speakers of English. The interviews were conducted by ESL instructors as part of the placement procedure for ESL classes at the Faculty of Extension, The University of Alberta. The interviews were conducted informally with the goal being the initiation of natural conversation. Thus the resulting corpus of actual language production is a fair equivalent to natural language. This corpus was restricted in two ways. It is restricted in terms of language background with only native South American Spanish speakers being used. Although the resultant dialogues used for the experiment were recorded by male speakers, both male and female speakers' utterances were included in the corpus. A native Spanish language background was chosen because there is a steady immigration of Spanish speakers to North America, and thus, the results of this study will be relevant. In relation to this point, subjects most likely would have been in contact with native Spanish speakers learning English previously. Thus, the experimental situation is not completely new to the subjects. The corpus was also restricted in terms of its correspondence to proficiency in English. To achieve this, only those interviewees who placed in higher level courses (intermediate, advanced) were included as data (error) sources.

The eight inteviews were transcribed and the sentences containing errors were extracted. These sentences were categorized into five major types, each with three subtypes. A category of sentences with multiple errors and a category of errorfree sentences (also with three subtypes each) completed the set of seven major stimulus types. Table I lists these stimulus types and their corresponding subtypes. The abbreviations following the types and subtypes are used in the graphs and discussion which follow. The error types are numbered from 1 to 7 and the suberrors from 1 to 21. This numbering is used to refer to the error types and suberror types in the graphs.[1]

From this corpus of sentences with errors, two dialogues, each between a non-native English speaker and a native English speaker, were written. The dialogues replicate the interview situation from which the corpus of original sentences was taken. Each dialogue included two tokens of each of the subtypes listed above. The sentences in the dialogues were as close as possible to the original sentences; however, in order to produce flowing conversation some changes, mostly lexical, were necessary. In any case it can be safely said that the two dialogues replicate an authentic interview situation. Although the dialogues were

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[1]The OmNnAdj suberror category actually contains one sentence with an omitted noun and one with an omitted adjective in one dialogue, and one sentence with an omitted noun and one with a wrong adjective in the second dialogue. The multiple error type is divided into subtypes on the basis of number of errors and sentence length. The errorfree type is divided on the basis of sentence length.

Table I. Error Types and Suberrors

1. MAJOR CONSTITUENTS(MC)
   1. nonparallel(Npar)
   2. word order(WO)
   3. repetition(Rep)

2. CONTENT WORDS(CW)
   4. wrong verb(WV)
   5. wrong noun(WN)
   6. omitted noun or adjective(OmNnAdj)

3. VERB MORPHOLOGY(VM)
   7. modal(Modal)
   8. participle(Part)
   9. tense(Tense)

4. FUNCTION WORDS(FW)
   10. pronouns(Pron)
   11. articles(Art)
   12. prepositions(Prep)

5. INFLECTIONS(INFL)
   13. plural(Pl)
   14. third person singular 's'(3rdPS)
   15. derivational(Der)

6. MULTIPLE ERRORS(MULT)
   16. two errors(Mult2)
   17. three errors(Mult3)
   18. five errors(Mult5)

7. ERRORFREE(EF)
   19. short(EF1)
   20. longer(EF2)
   21. longest(EF3)

not identical the topics of converstion were similar, e.g., native country, future plans, questions about the course (see APPENDIX A. Dialogues).[2]

By contextualizing the sentences to be judged, the results reflect the effect of errors in real life situations. The context of a sentence plays a role in comprehensibility. A sentence uttered in isolation may be meaningless, but if it is uttered in context the intended message may be clear. Requesting judgements on sentences uttered in isolation could perhaps produce results which are not a valid reflection of the true effects of language deviances.

To determine whether a non-native English speaker's accent has any effect on a listener's comprehension or affective reaction, two male native Spanish speakers were contrasted. Two speakers of the same sex were chosen to prevent a sex-bias effect. Both speakers were proficient in English, but their pronunciation was still influenced by their native Spanish. The nativelikeness of their pronunciation varied. The more native-English-like speaker was from Venezuela and had lived in an English speaking country for eight years. The second speaker was Colombian and had been in an English speaking country for less than one year. Neither speaker's accent was severe enough to hinder comprehensibility as a direct result of his

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[2]Both dialogues contain one extra subtype which is not included in the results. Dialogue One has an extra Mult2 sentence (#22). Dialogue Two contains an extra EF3 sentence (#39).

pronunciation. The two speakers were chosen to have rather similar voices, both baritones and judged "pleasant" by several independent judges.

Each speaker recorded both dialogues. Thus combining the speakers and dialogues and the order in which they were heard results in four possible combinations, each consisting of two presentations. The subjects were divided into four groups with each group hearing a different combination of presentations - Group One: Speaker one/Dialogue one and Speaker two/Dialogue two; Group Two: Speaker two/Dialogue two and Speaker one/Dialogue one; Group Three: Speaker two/Dialogue one and Speaker one/Dialogue two; Group Four: Speaker one/Dialogue two and Speaker two/Dialogue one. Thus, in the overall scores for errors and for the two speakers, any possible differences caused by the different dialogues and/or the order in which the speakers/dialogues were presented is cancelled out.

3.3 Subjects

Ninety-two subjects participated in the experiment, and were divided into four groups of twenty-three with each group hearing one of the four combinations. The subjects were all native speakers of English and were all university students taking an introductory psychology course. They participated in this study for a portion of their psychology course mark. The subjects were not aware of the nature or subject of the experiment beforehand. The average age of the

subjects was twenty, ranging from eighteen to forty-two. There were forty-eight females and forty-three males (and one subject who did not indicate his/her sex). Seventy-three of the subjects knew or had studied another language. Ninety percent of these subjects knew or had studied French. On the average the subjects had known or studied a language for five years. Most of the subjects stated that their criteria for the affective reaction task was based on grammar and/or comprehensibility. Pronunciation and clarity or appropriateness of the message were also stated as criteria.

The subjects participated in the experiment in small groups. The entire experimental task was about one and one half hours in duration. The stimuli were presented to the subjects via tape recordings. The subjects heard the first presentation twice, the first time performing the affective reaction task and the second time performing the task designed to determine comprehension. They then heard the second presentation twice and performed the two tasks in the same sequence.

After the subjects had completed the experiment they were asked to fill out an information sheet. They recorded their age, sex, other languages studied or spoken, and the criteria they used for the affective reaction task (see APPENDIX B. Subject Information Sheet). Two of the questions on the information sheet are not discussed (#4 and #6) because most of the subjects were not taking or had not taken the courses inquired about.

3.4 Task A: The Affective Reaction Task

Task A is designed to elicit subjects' subjective reactions to sentences containing errors. These reactions were elicited by means of asking subjects to rate their responses to specific sentences on a scale of 1 to 7, with 7 being a more positive reaction and 1 being a more negative reaction. The written instructions for this task were purposely unspecific as to what constitutes an affective reaction so as to allow for individual variation. The instructions simply stated that all errors made by English learners are not judged equivalently by listeners; some errors provoke a more negative reaction than others (see APPENDIX C. Subject Score Sheet). Thus a variety of interpretations corresponding to the subjects' individual criteria for judgement is allowed for. In the oral explanation several examples of what the criteria might be were mentioned (e.g., degree of comprehensibility, grammatical accuracy, irritation, acceptability), and the subjects were cautioned to remain consistent in the criteria used thoughout Task A for both speakers. The subjects heard six practice sentences before the first presentation to insure they understood the task and to allow them to establish their criteria. The practice sentences had been recorded by a female speaker from Colombia and were not part of the actual test dialogues. Any questions the subjects had were answered after the practice sentences had been heard. The practice sentences were not repeated before Task A was

performed on the second presentation. The dialogues were played with a short pause following each of the forty-two sentences uttered by the non-native speaker to allow time for the judgements to be made.

3.5 Task B: The Comprehensibilty Task

Task B followed Task A for both speakers. Thus, the subjects were already familiar with the dialogue heard for Task B. The subjects were instructed to write down what they thought the foreign speaker was trying to say, staying as close as possible to the original. It was hoped that asking the subjects to write down what they thought the foreign speaker meant to say or was trying to say would result in an interpretation of the utterances from which comprehensibility could be judged. It was assumed that asking the subjects to stay as close as possible to the original utterance prevented paraphrases or interpretations worded according to the specific subject's language style. The written instructions did not state directly that the subjects were to *correct* the errors, so as to focus the task on comprehension rather than prescriptive error correction. The instructions also stated that some sentences, i.e., the errorfree sentences, may not need changes. It was also suggested that extensive rewording of sentences could be done if subjects felt it was not possible to remain close to the original. Subjects were given as long as they needed after each utterance by the foreign speaker to write down

what they thought the speaker meant to say. The subjects heard the same six practice sentences that were used for Task A before Task B was performed on the first presentation. Again, any questions were answered after the practice sentences had been heard.

3.6 Scoring

Scoring the responses for Task A was straightforward since the method of response was a numerical score. Thus the subjects' scores needed no further conversion.

The scoring of Task B was not as straightforward. The subjects' rewritten sentences were interpreted in terms of a five point scale. A score of 5 indicated that the subjects clearly understood the intended meaning of the utterance. A 4 indicated a minor misunderstanding. If the main idea was still represented in the rewritten sentence but other changes had been made, a score of 3 was given. A score of 2 indicated that the main idea of the utterance was not understood, although, minor parts of the utterance were understood. If the utterance was completely misunderstood a score of 1 was assigned. The scores for Task B were interpreted by the writer over a period of six weeks and then were rechecked for consistency.

3.7 Analysis

In the analysis of the results the seven error types, twenty-one specific suberrors, the two speakers, the subjects and the four subject groups were looked at for the affective reaction scores and the comprehensibility scores. The groups are for the most part only examined overall as the results are of secondary importance in terms of the purposes of the experiment. The results for negative reaction and comprehensibility are correlated to see if these scores are related in any way.

4. RESULTS

4.1 Introduction

The results for Task A, the affective reaction scores, and Task B, the comprehensibility scores were analysed separately. For both analyses, a multifactored repeated measures analysis of variance (ANOVA) provided by the BMDP 8V statistical package was used (see APPENDIX D. BMDP Program and Datafiles). In the design the independent variables were: subjects, groups, speakers, error types and suberrors (each suberror had two replications). The dependent variables were the affective reaction scores and the comprehensibility scores. For purposes of analysis speakers were termed talkers and suberrors were termed undererrors. These analysis terms will be used in the following discussion. The more nativelike speaker (Venezuelan) will be referred to as talker one and the other speaker (Colombian) as talker two. To determine significant differences between error types and undererrors, tukey tests were done on pairs of mean scores.

The scores from the two analyses were also correlated using the Midas Interactive Data Analysis System. A correlation of all the scores obtained (every subject's score on every replication) was done as well as a correlation of the combined subjects scores on the undererror types for each talker.

4.2 Affective Reaction Analysis

4.2.1 Introduction

In the analysis of the affective reaction scores (ranging from 1 to 7, where 1 corresponds to a more negative reaction and 7 to a more positive reaction) almost all of the factors and their interactions turned out to be significant. Thus, it can safely be said that subjects do differentiate in their subjective reactions to a speaker and/or what the speaker says. The ANOVA results are shown in Table II. The sum of squares shown in Table II indicates that the main effect for subjects accounts for the greatest proportion of variation followed by errors and subject by error interaction.

4.2.2 Subjects

The main effect for subjects is significant ($p=0.0$). Although interactions involving subjects are significant, this main effect is briefly discussed to give an overall view of the subjects and so that a general comparison can be made between the affective reaction scores and the comprehensibility scores. Figure 1 is a bar graph which illustrates the subject variation. The information gathered for each subject, i.e., age, sex, other languages spoken or studied, or the criteria used in determining the reaction, does not offer any explanation for this variation. The

Table II. Anova for Affective Reaction Results

	SOURCE	ERROR TERM	SUM OF SQUARES	D.F.	MEAN SQUARE	F	PROB.	EXPECTED MEAN SQUARE
1	MEAN	S(G)	195637.641	1	0.19564E+06	4916.60	0.0000	7728(1) + 84(5) + (19)
2	GROUPS	S(G)	274.028	3	91.343	2.30	0.0833	1932(2) + 84(5) + (19)
3	ERRORS	SE(G)	1289.922	6	214.99	146.13	0.0	1104(3) + 12(10) + (19)
4	TALKERS	ST(G)	465.659	1	465.66	58.20	0.0000	3864(4) + 42(12) + (19)
5	S(G)	R(GSEUT)	3501.628	88	39.791	33.56	0.0	84(5) + (19)
6	U(E)	SU(GE)	376.397	14	26.885	26.84	0.0	368(6) + 4(15) + (19)
7	GE	SE(G)	75.550	18	4.1972	2.85	0.0001	276(7) + 12(10) + (19)
8	GT	ST(G)	126.516	3	42.172	5.27	0.0022	966(8) + 42(12) + (19)
9	ET	SET(G)	35.567	6	5.9278	6.48	0.0	552(9) + 6(16) + (19)
10	SE(G)	R(GSEUT)	776.814	528	1.4712	1.24	0.0003	12(10) + (19)
11	GU(E)	SU(GE)	89.995	42	2.1427	2.14	0.0000	92(11) + 4(15) + (19)
12	ST(G)	R(GSEUT)	704.076	88	8.0009	6.75	0.0	42(12) + (19)
13	UT(E)	SUT(GE)	35.375	14	2.5268	2.64	0.0009	184(13) + 2(18) + (19)
14	GET	SET(G)	397.617	18	22.090	24.16	0.0	138(14) + 6(16) + (19)
15	SU(GE)	R(GSEUT)	1234.275	1232	1.0018	0.84	0.9998	4(15) + (19)
16	SET(G)	R(GSEUT)	482.816	528	0.91442	0.77	0.9999	6(16) + (19)
17	GUT(E)	SUT(GE)	370.060	42	8.8109	9.20	0.0	46(17) + 2(18) + (19)
18	SUT(GE)	R(GSEUT)	1179.565	1232	0.95744	0.81	1.0000	2(18) + (19)
19	R(GSEUT)		4581.500	3864	1.1857			(19)

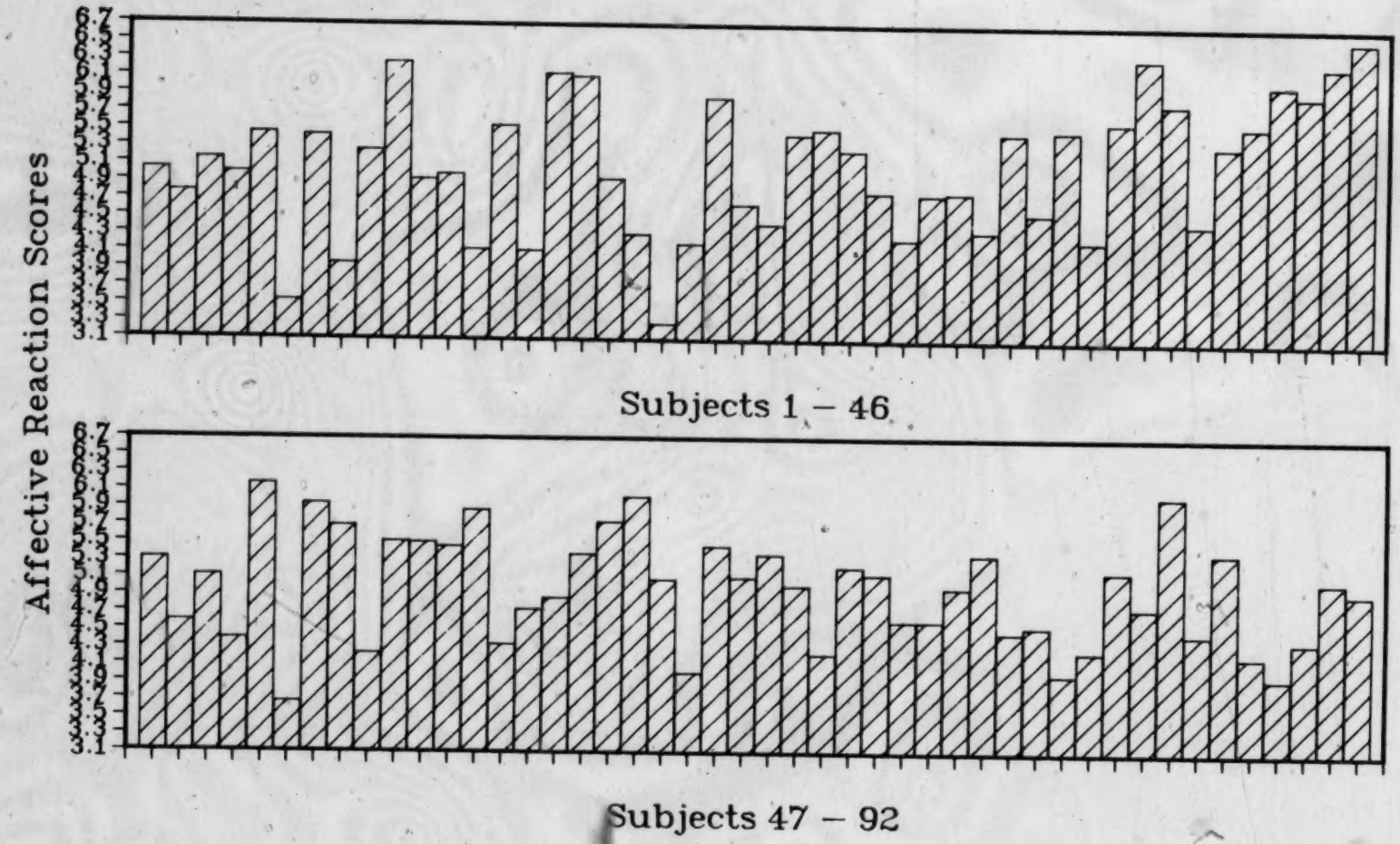

Figure 1. Affective Reaction – Subjects – Main Effect

subject by error interaction is significant (p=0.0003); however, subject by undererror is not significant (p=0.9998). (The results for the subject by error interaction are too extensive to represent graphically. These results are listed in APPENDIX E. Additional Results.) Thus, among individual subjects, undererrors were regarded similarly while the error types were viewed differently. Neither the subject by error by talker nor the subject by undererror by talker interaction is significant (p=0.9999, p=1.0 respectively). Thus, when specific scores for talkers are compared, we find that the subjects tend to be quite consistent in their judgements.

The subject by talker interaction is also significant (p=0.0); seventy-four out of the ninety-two subjects scored talker one higher than talker two overall. A scattergram, Figure 2, plotting talker one against talker two by subject, indicates that there is a general trend for the subjects to score both talkers either higher or lower; that is, the sections of the graph indicating a high score for talker one but a low score for talker two, or vice versa are not very populated. The degree of variation among subjects is highly evident. There does not appear to be any obvious clustering of subjects. If there were a certain set number of strategies that people use in determining their reaction, we could expect some clustering in the points. This does not appear to be the case; thus individual differences or strategies must account for the significant subject by

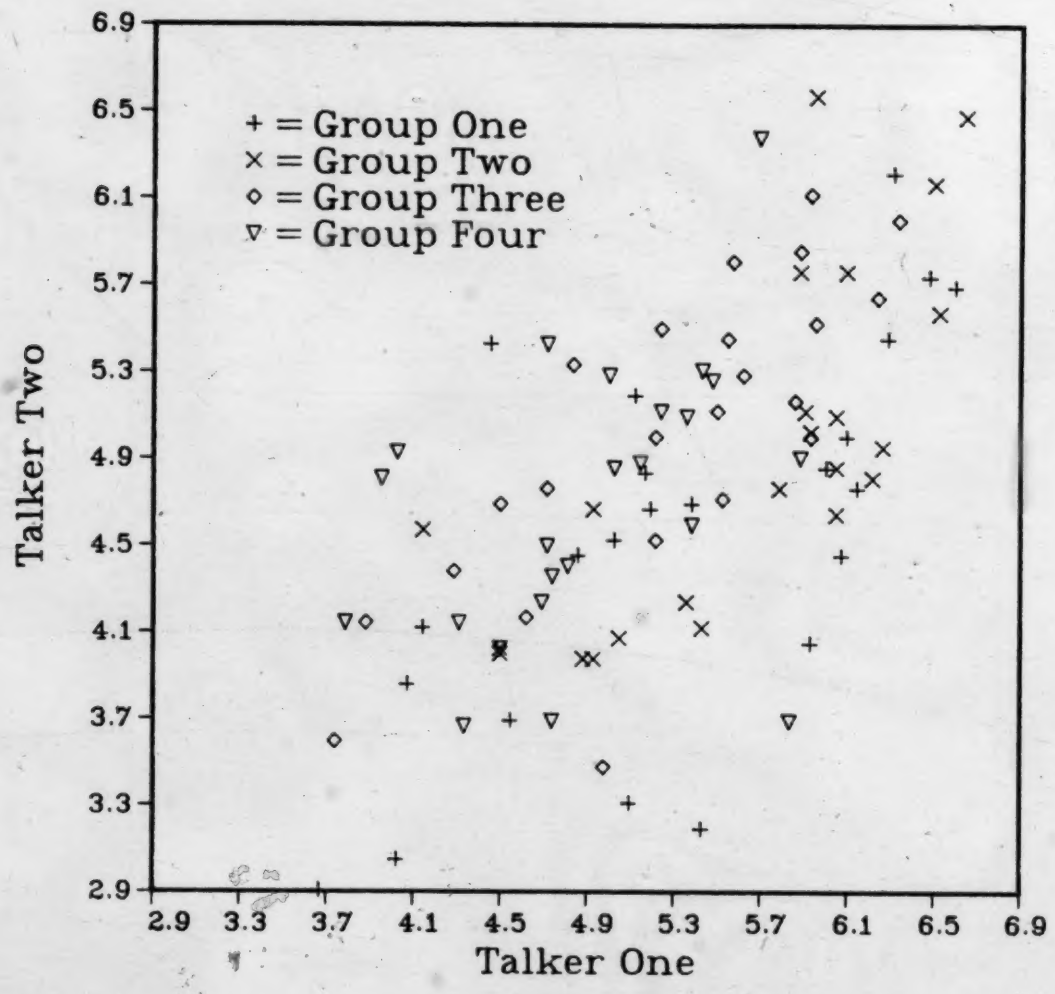

Figure 2. Affective Reaction – Subject by Talker Interaction

talker interaction.

4.2.3 Groups

Although the inclusion of groups in the experimental design is intended as a counterbalance measure rather than a variable, the differences between them may still be of interest. The main effect for groups is not significant ($p=0.0833$) but all of the subsequent interactions are significant. In the group by error by talker interaction ($p=0.0$) all groups scored the errorfree sentences highest and the multiple errors lowest, except for groups one and two which scored the inflection errors higher than the errorfree type. The remaining error types do not place consistently across groups. With the exception of three pairings, all groups scored talker one higher than talker two on specific error types (see APPENDIX E. Additional Results for actual scores). Group by undererror ($p=0.0$) is also significant. For the group by undererror by talker results ($p=0.0$), Figures 3a to 3d illustrate that talker one generally received better scores if heard second. Talker two was scored higher if he was heard first. Both speakers received better scores on the first dialogue than the second dialogue. Each dialogue has a consistent pattern regardless of the speaker or order and the patterns for the two dialogues are different from each other.

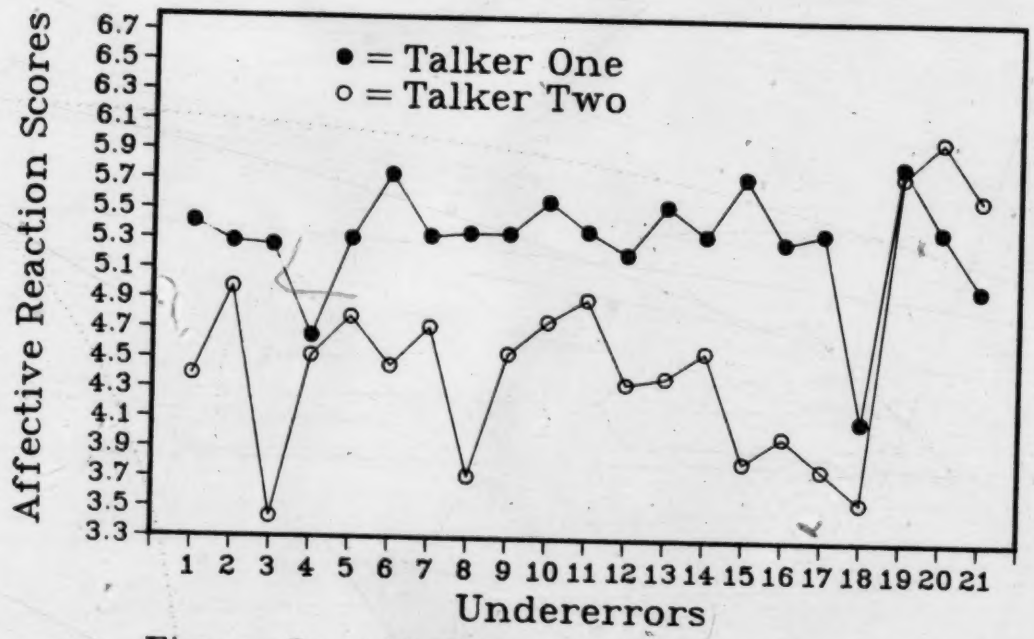

Figure 3a. Affective Reaction – Group One
Group by Undererror by Talker Interaction

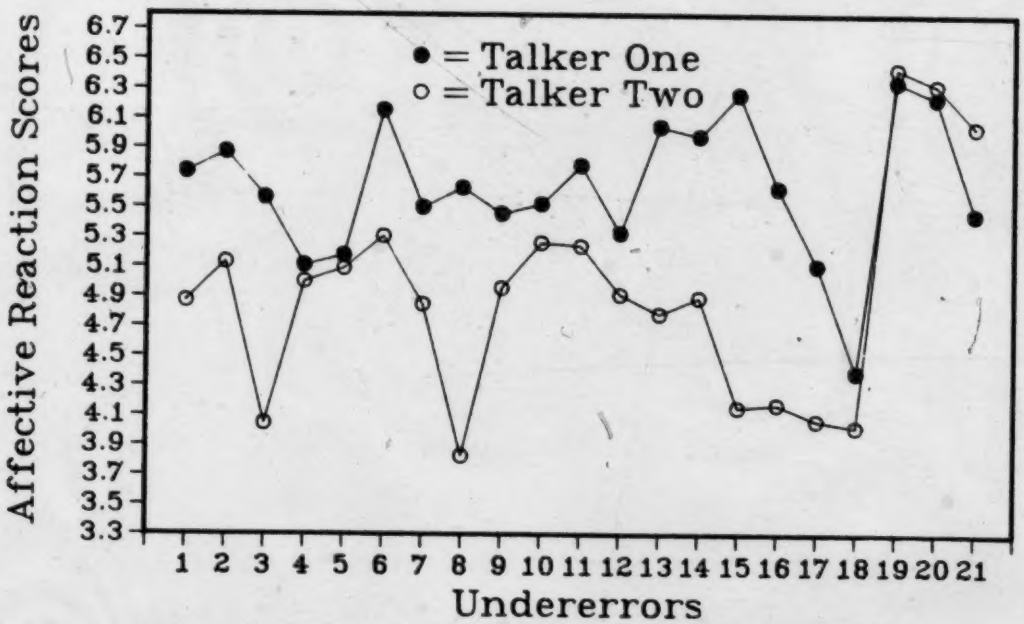

Figure 3b. Affective Reaction – Group Two
Group by Undererror by Talker Interaction

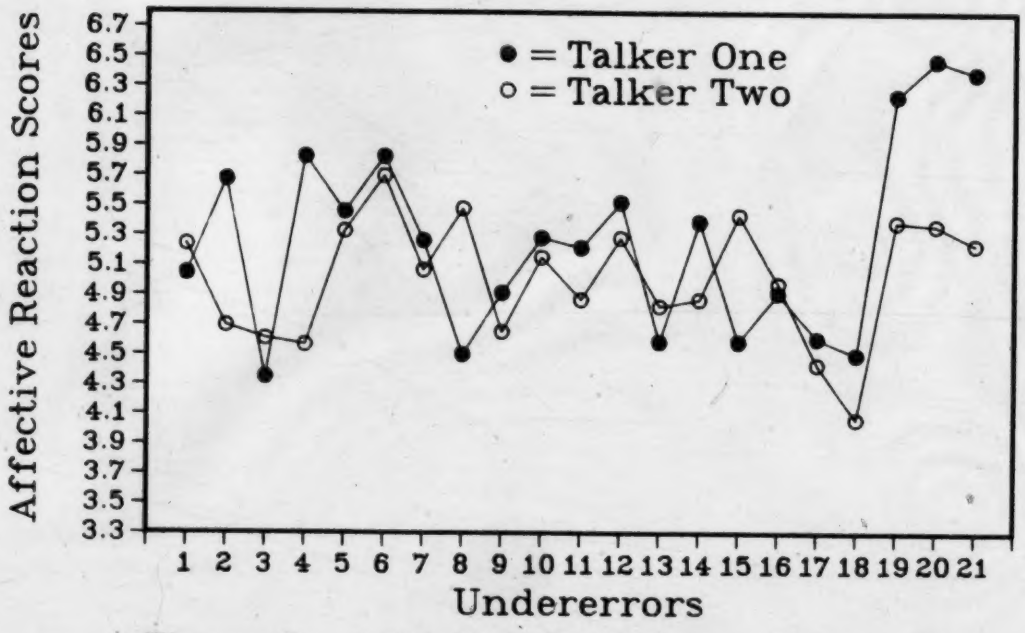

Figure 3c. Affective Reaction – Group Three
Group by Undererror by Talker Interaction

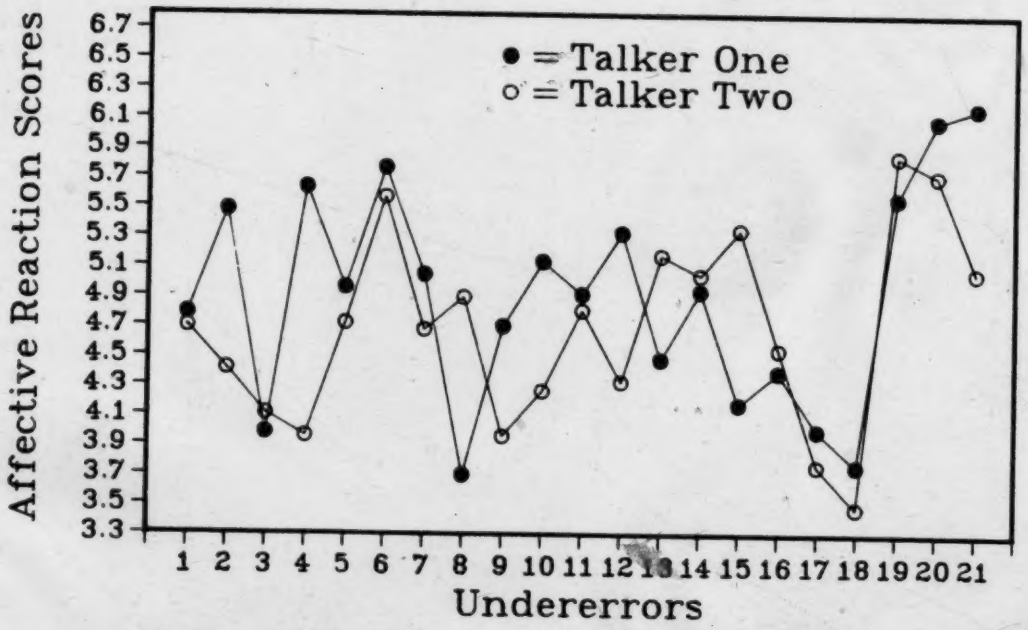

Figure 3d. Affective Reaction – Group Four
Group by Undererror by Talker Interaction

4.2.4 Talkers

The main effect for talkers is significant (p=0.0) with talker one scoring an average of 5.28 and talker two scoring an average of 4.79. Talker by error was also significant (p=0.0). Talker one scored higher than talker two on all seven error types, as Figure 4 illustrates. Talker by undererror is significant (p=0.0009) and, as Figure 5 illustrates, talker one scored higher than talker two on all twenty-one errors.

4.2.5 Error Types

The error by talker interaction is significant (p=0.0). Thus the error types had differing effects depending on the talker. The scores for this interaction are rank ordered in Table III. The scores for each talker are ranked similarly except that the scores for talker one are higher for major constituents than for verb morphology whereas talker two was scored higher on verb morphology; however, tukey tests show that these two types are not significantly different. According to the tukey tests, the errorfree sentences are significantly higher than the remaining types. Multiple errors were scored lowest for both talkers; however, for talker two this error type is not significantly different from major constituent errors. For talker two, inflection errors are not significantly different from content word errors whereas for talker one they are. In the talker one results, multiple errors are significantly different from

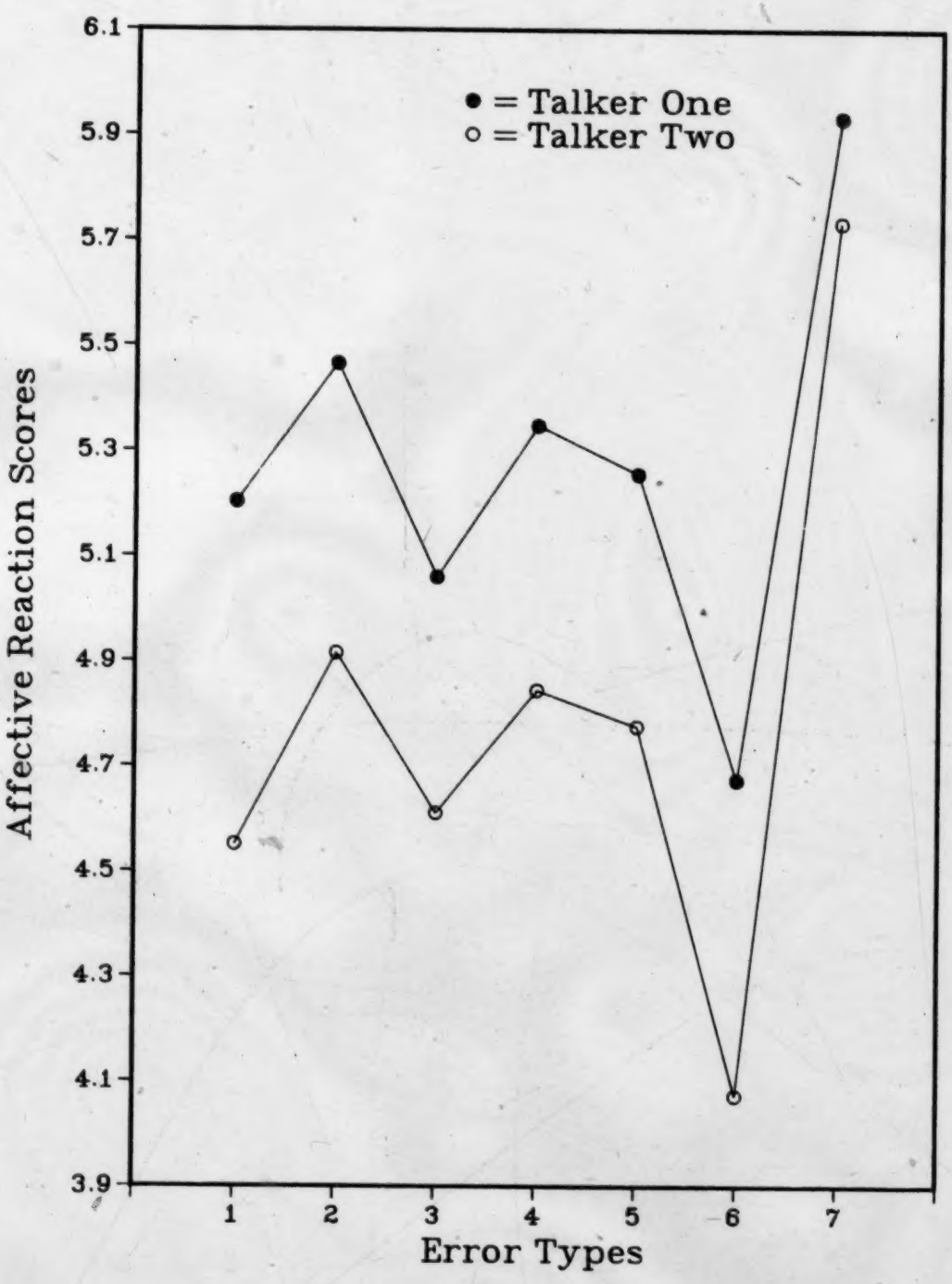

Figure 4. Affective Reaction – Error by Talker Interaction

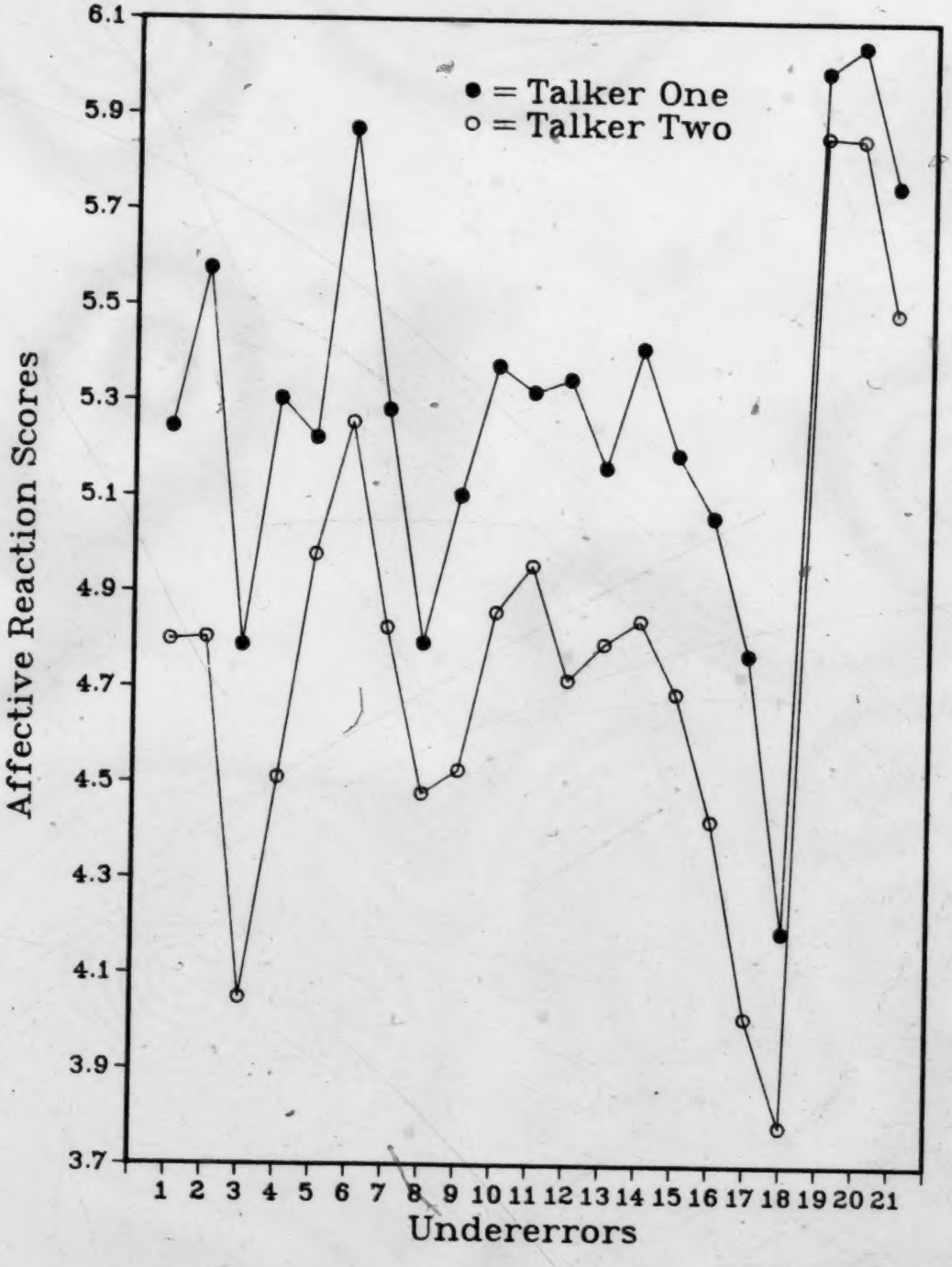

Figure 5. Affective Reaction – Undererror by Talker Interaction

Table III. Error by Talker - Affective Reaction Scores and Tukey Test Results

Talker One		Talker Two	
EF	5.93297	EF	5.73370
[CW	5.46558	[CW	4.91486
FW]	5.34783	FW]	4.84420
[INFL	5.25543	[INFL	4.77536
MC]	5.20290	VM]	4.61051
VM]	5.05978	[MC	4.55076
Mult	4.67391	Mult]	4.07246

[Not significantly different by tukey tests

The error abbreviations are shown in full form in Table 1.

the six remaining types; in the talker two results they are similar to the major constituent type. The main effect for errors (p=0.0) summarizes the basic similarities between talker one and talker two. Thus, for the reader's benefit, Table IV and Figure 6 which represent the scores for the main effect errors are included. According to tukey tests done on the twenty-one undererror scores for each talker(see Table V in Section 4.2.6) only errorfree, function word and inflection error types are not significantly different within their own error type for talker one. For talker two only function words, inflections and verb morphology operated similarly and formed cohensive groups. The remaining error types for each talker for the most part functioned independently.

4.2.6 Undererrors

The undererror by talker interaction is significant (p=0.0009). This interaction addresses itself to two main questions prompting this particular experimental design. It addresses itself to the influence of accent level and to the effects of different errors. Table V is a graduated representation of the results for the twenty-one undererrors for each talker. Overall, talker one always scored higher than talker two. The order of errors from highest to lowest is not identical for the two talkers; however, the orders are similar. Tukey tests indicate that for talker one, the errorfree sentences and OmNnAdj sentences are similar.

Table IV. Error Types - Affective Reaction Scores and Tukey Test Results

Errorfree	5.83333
Content Words	5.19022
Function Words	5.09601
Inflections	5.01540
Major Constituents	4.87681
Verb Morphology	4.83514
Multiple Errors	4.37319

[Not significantly different by tukey tests

The error abbreviations are shown in full form in Table 1.

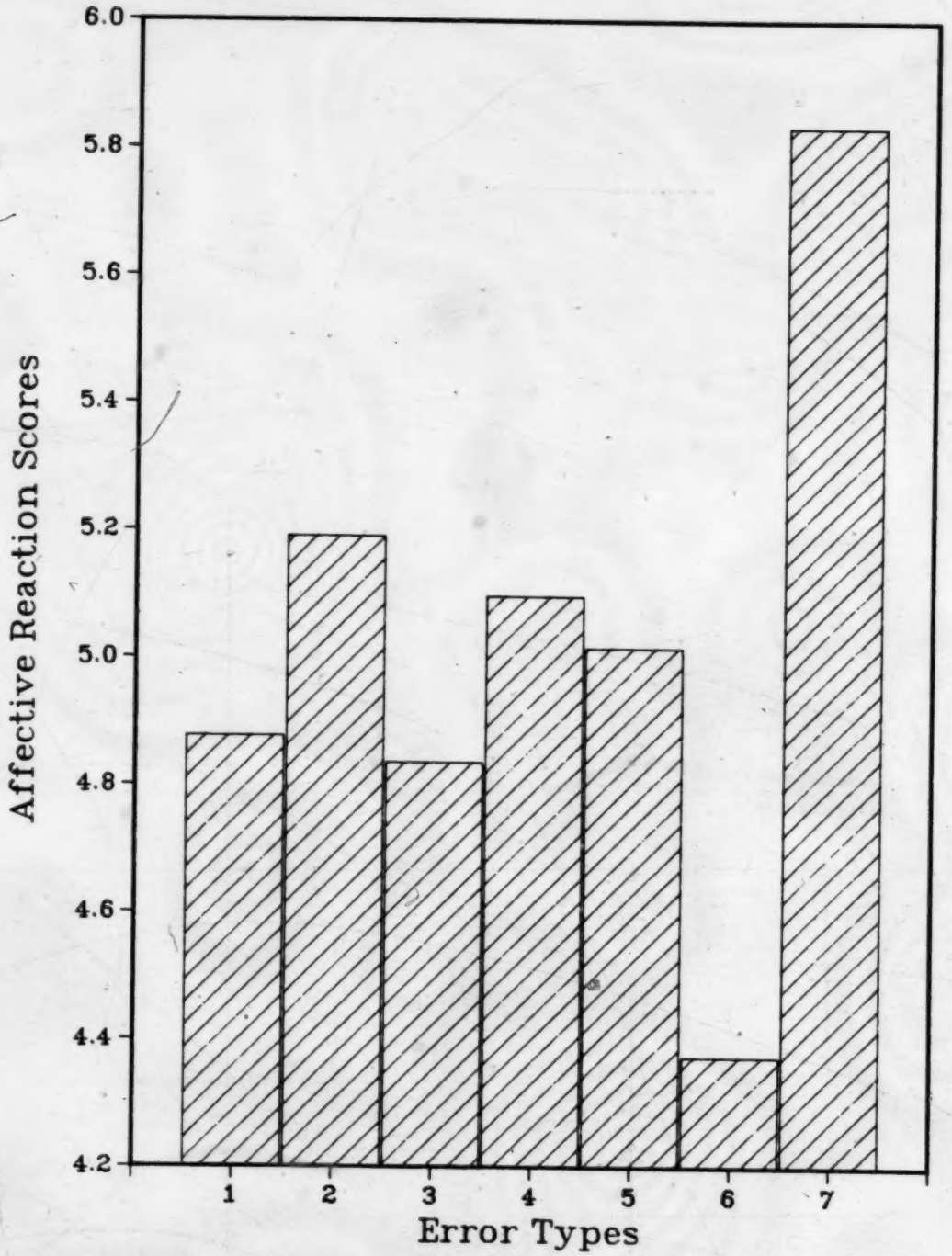

Figure 6. Affective Reaction – Error Types – Main Effect

Table V. Undererror by Talker - Affective Reaction Scores and Tukey Test Results

Talker One		Talker Two	
EF2	6.04891	EF1	5.85870
EF1	5.99457	EF2	5.85326
OmNnAdj	5.86957	EF3	5.48913
EF3	5.75543	OmNnAdj	5.25543
WO	5.57609	WN	4.97826
3rdPS	5.41304	Art	4.95652
Pron	5.37500	Pron	4.85870
Prep	5.34783	3rdPS	4.84239
Art	5.32065	Modal	4.82609
WV	5.30435	WO	4.80435
Modal	5.28261	Npar	4.79891
Npar	5.24457	Pl	4.79348
WN	5.22283	Prep	4.71739
Der	5.19022	Der	4.69022
Pl	5.16304	Tense	4.52717
Tense	5.10326	WV	4.51087
Mult2	5.05978	Part	4.47826
Part	4.79348	Mult2	4.42391
Rep	4.78804	Rep	4.04891
Mult3	4.77174	Mult3	4.01087
Mult5	4.19022	Mult5	3.78261

[Not significantly different by tukey tests

The error abbreviations are shown in full form in Table 1.

Function word errors, inflection errors as well as WV, WN, Modal, Npar, Tense, and Mult2 errors were given similar scores. WO sits in the middle between the highest and second highest groupings. Part, Rep and Mult3 errors, along with the last two undererrors from the next highest grouping (Tense and Mult2) were similar in effect. The effect of Mult5 was different from all the others. The results for talker two do not group into as few distinctive groups as the results for talker one do. The groupings overlap to a greater extent. The two shorter errorfree sentences group together. The longest errorfree sentence and OmNnAdj group together. Again all of the function word and inflection errors and WN, Modal, WO and Npar operated similarly. All of the verb morphology errors along with WO, Npar, Pl, Prep, Der and WV form an overlapping group with the third highest grouping. Mult2 groups itself with the lower half of the group just described. Rep, Mult3 and Mult5 group together to form the lowest group. Give or take one grouping, the results of the significant differences between undererrors for the two talkers are similar. However, the fact that the groupings are significantly different from each other is a clear indication that accent level does have a significant effect on listeners' affective judgements.

The main effect for undererrors is also significant ($p=0.0$). These results are represented in Table VI and Figure 7. Tukey tests show that the shorter errorfree sentences, EF1 and EF2, produced similar results but are

Table VI. Undererrors - Affective Reaction Scores and Tukey Test Results

EF2	5.95109
EF1	5.92663
EF3	5.62228
OmNnAdj	5.56250
WO	5.19022
Art	5.13859
3rdPS	5.12772
Pron	5.11685
WN	5.10054
Modal	5.05435
Prep	5.03261
Npar	5.02174
Pl	4.97826
Der	4.94022
WV	4.90761
Tense	4.81522
Mult2	4.74185
Part	4.63587
Rep	4.41848
Mult3	4.39130
Mult5	3.98641

[Not significantly different by tukey tests

The error abbreviations are shown in full form in Table 1.

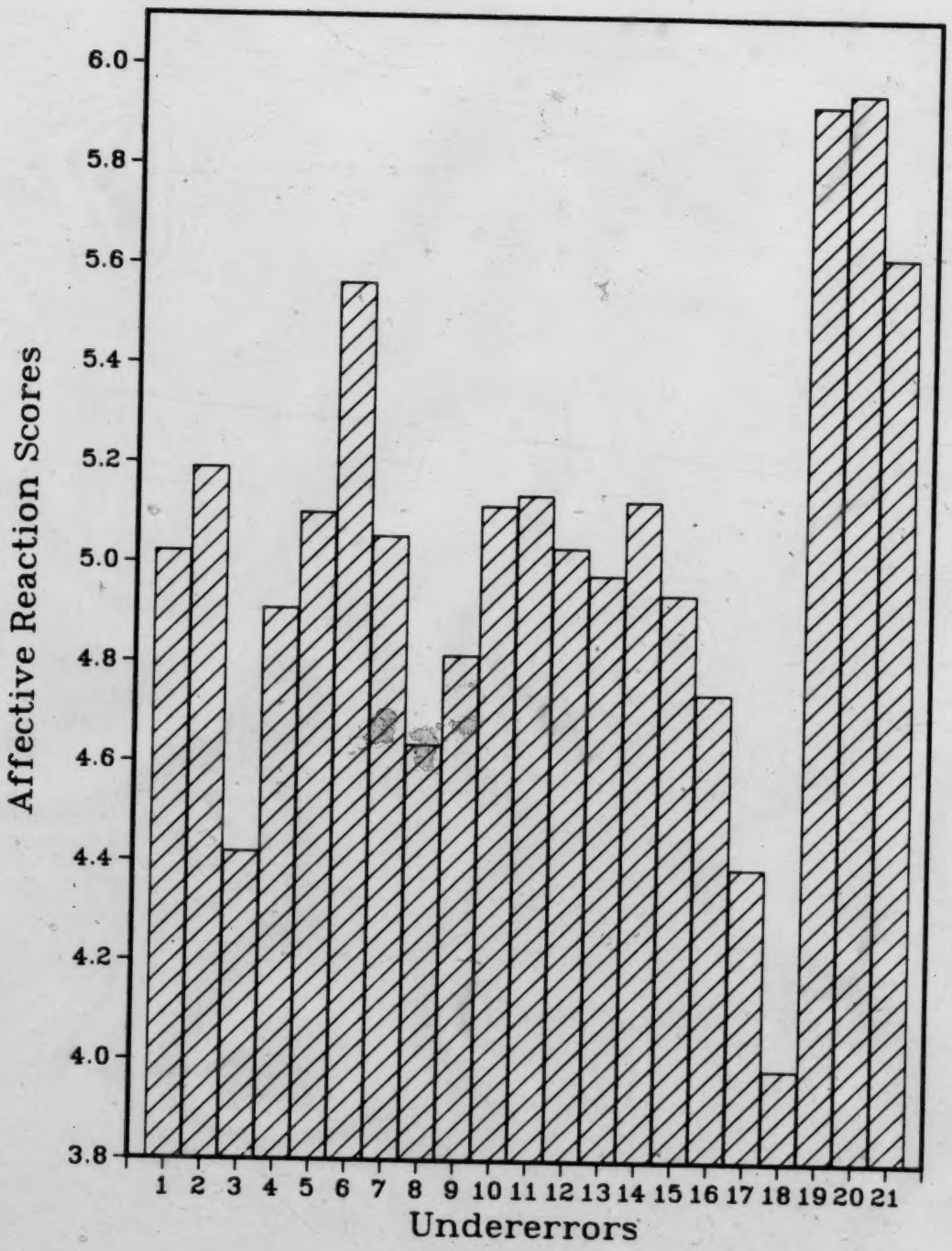

Figure 7. Affective Reaction – Undererrors – Main Effect

significantly different from EF3 which clusters with OmNnAdj. All of the function word and inflection undererrors, two of the content word errors (WN and WV), two of the major constituent errors (WO and Npar), and M produced similar results. T, Mult2 and Part then cluster together followed by Rep and Mult3. Mult5 is significantly different from all the rest.

4.3 Comprehensibility Analysis

4.3.1 Introduction

The analysis of the comprehensibility scores (ranging from 1 to 5, where 1 indicates complete miscomprehension and 5 indicates complete understanding) indicate that there is not as much variability among the factors as there is with the affective reaction scores. The ANOVA results for comprehensibility in Table VII indicate that fewer of the interactions are significant in the comprehensibility results than in the affective reaction results. The main effects for subjects, error types and undererrors are significant. Talkers is not significant and, as in the affective reaction results, groups is not significant. The sum of squares in Table VII indicate that errors account for the greatest proportion of variance. Thus, it appears that it is the actual errors which affect comprehensibility. The accent of the talkers and the other factors did not account

Table VII. Anova for Comprehensibility Results

	SOURCE	ERROR TERM	SUM OF SQUARES	D.F.	MEAN SQUARE	F	PROB.	EXPECTED MEAN SQUARE
1	MEAN	S(G)	0.14774E+06	1	0.14774E+06	68455.56	0.0000	7728(1) + 84(5) + (19)
2	GROUPS	S(G)	4.6598	3	1.5533	0.72	0.5428	1932(2) + 84(5) + (19)
3	ERRORS	SE(G)	1257.7	6	209.62	290.77	0.0	1104(3) + 12(10) + (19)
4	TALKERS	ST(G)	0.19682	1	0.19682	0.25	0.6197	3864(4) + 42(12) + (19)
5	S(G)	R(GSEUT)	189.91	88	2.1581	1.65	0.0001	84(5) + (19)
6	U(E)	SU(GE)	570.74	14	40.767	59.56	0.0	368(6) + 4(15) + (19)
7	GE	SE(G)	26.464	18	1.4702	2.04	0.0070	276(7) + 12(10) + (19)
8	GT	ST(G)	6.4973	3	2.1658	2.73	0.0487	966(8) + 42(12) + (19)
9	ET	SET(G)	41.172	6	6.8620	9.32	0.0	552(9) + 6(16) + (19)
10	SE(G)	R(GSEUT)	380.63	528	0.72089	0.55	1.0000	12(10) + (19)
11	GU(E)	SU(GE)	73.764	42	1.7563	2.57	0.0000	92(11) + 4(15) + (19)
12	ST(G)	R(GSEUT)	69.842	88	0.79365	0.61	0.9986	42(12) + (19)
13	UT(E)	SUT(GE)	50.101	14	3.5787	5.42	0.0	184(13) + 2(18) + (19)
14	GET	SET(G)	520.15	18	28.897	39.27	0.0	138(14) + 6(16) + (19)
15	SU(GE)	R(GSEUT)	843.33	1232	0.68452	0.52	1.0000	4(15) + (19)
16	SET(G)	R(GSEUT)	388.56	528	0.73590	0.56	1.0000	6(16) + (19)
17	GUT(E)	SUT(GE)	410.78	42	9.7805	14.80	0.0	46(17) + 2(18) + (19)
18	SUT(GE)	R(GSEUT)	813.95	1232	0.66067	0.51	1.0000	2(18) + (19)
19	R(GSEUT)		5049.5	3864	1.3068			(19)

for as much variation as they did with the affective reaction scores.

4.3.2 Subjects

The main effect for subjects is significant (p=0.0001). Again this variation can be attributed only to individual variation or unknown factors, as the age, sex, or other languages studied or spoken do not account for the variation. The amount of variation among subjects is much less in the comprehensibility scores than in the affective reaction scores as comparing Figures 1 and 8 indicates. The subject by talker interaction (p=0.9986) is not significant; however, it is discussed here to allow for comparison with the corresponding interaction in the affective reaction results. The nonsignificance of this interaction indicates that the strength of accent did not affect the subjects in terms of comprehensibility. Figure 9, a scattergram of this interaction, shows a plotting of the subjects in one major cluster with just a few outliers.

4.3.3 Groups

Again, the results for groups will be discussed as a matter of interest, although they do not directly pertain to the goals of this experiment. The main effect for groups is not significant (p=.5428). The subsequent interactions involving error type or undererror are significant: group by error (p=.0070), group by undererror (p=0.0). Group by error

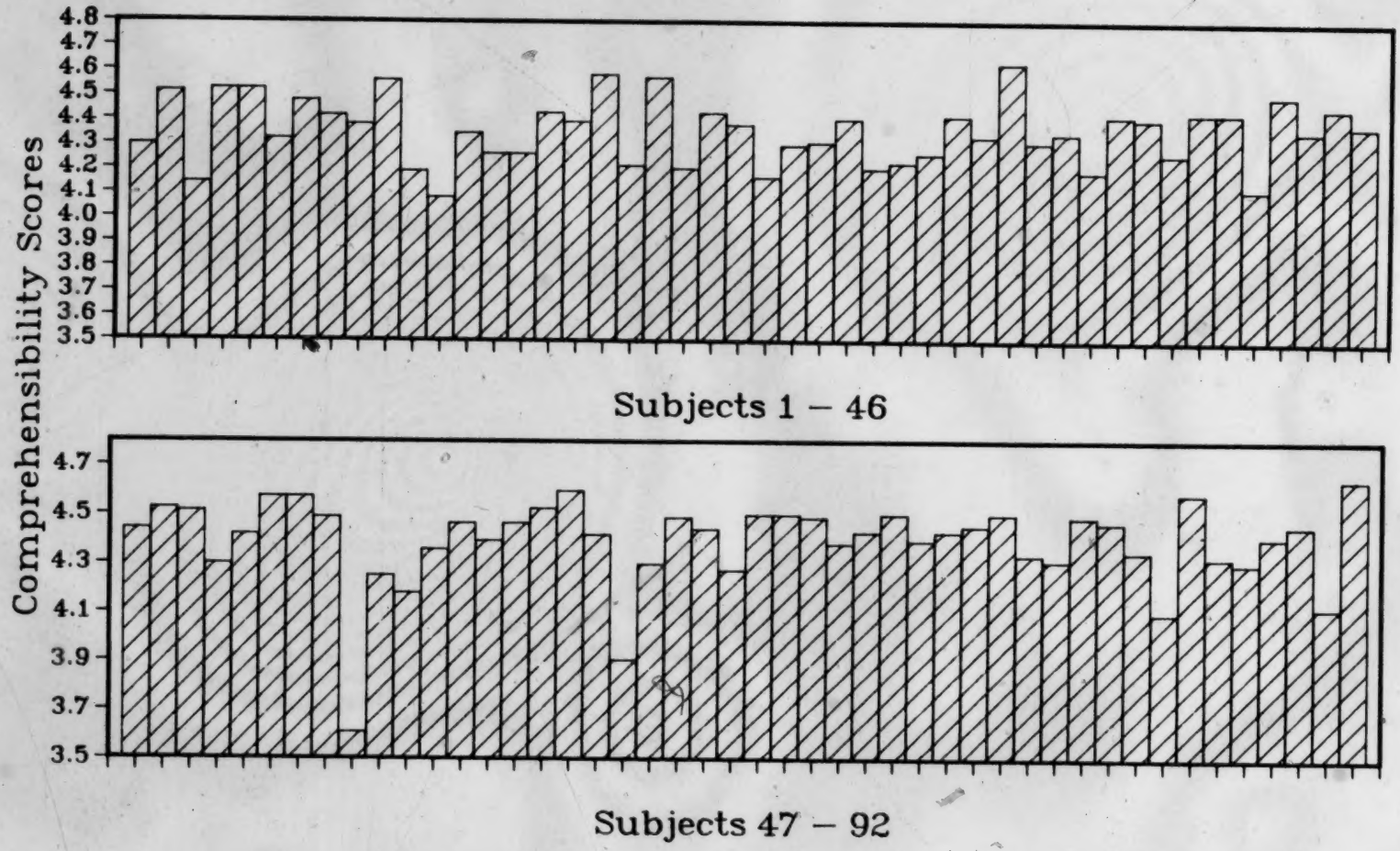

Figure 8. Comprehensibility – Subjects – Main Effect

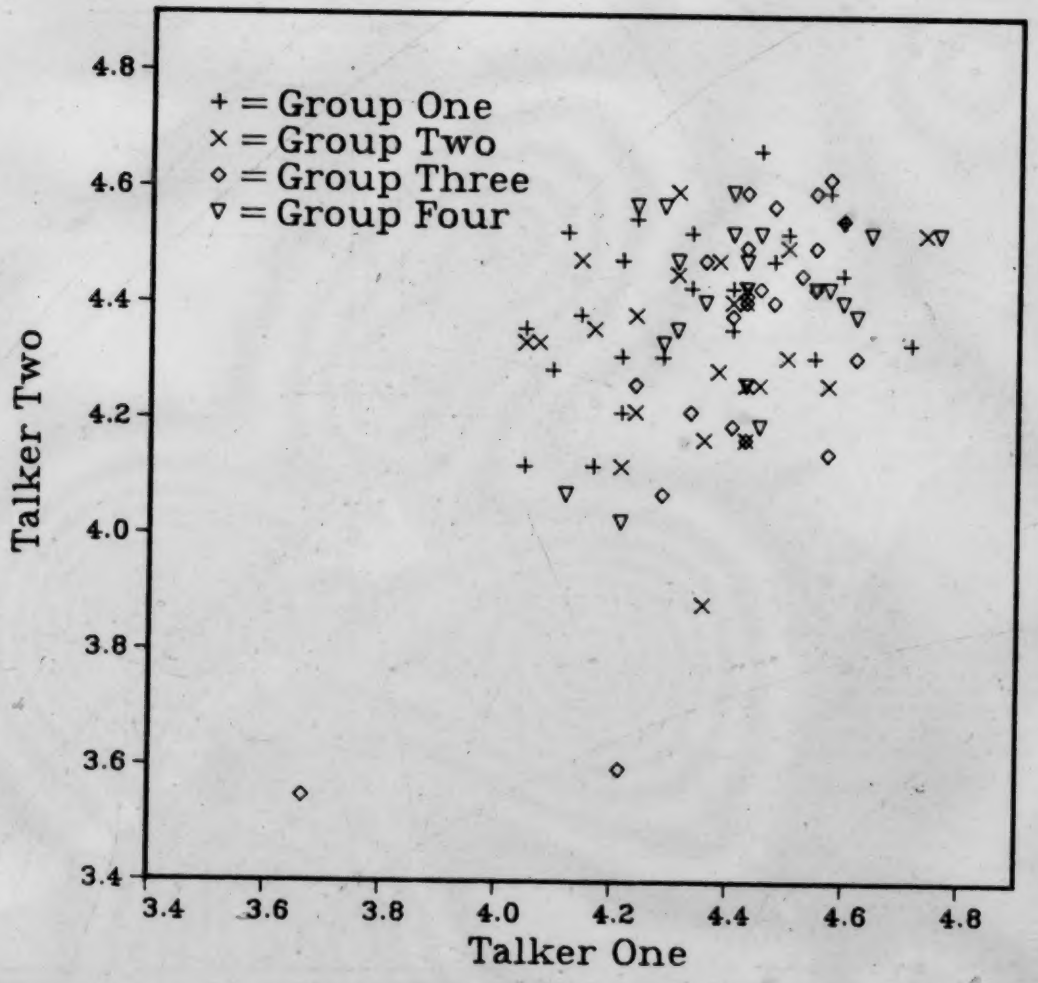

Figure 9. Comprehensibility – Subject by Talker Interaction

by talker is significant (p=0.0); however, neither talker scores consistently higher. All four groups scored errorfree or function word types highest. Major constituents were scored lowest for all four groups. The remaining error types varied as to the position of their scores (see APPENDIX E. Additional Results for these scores). Group by undererror by talker (p=0.0) is also significant. Figures 10a to 10d illustrate these results. Inspection of these results indicates that the dialogue heard seems to have more influence on scores than the speaker heard. All of the representations of the results when the first dialogue was heard follow a similar pattern (i.e., talker one in groups one and two, and talker two in groups three and four). The same is true for the results representing the second dialogue (talker two in groups one and two, and talker one in groups three and four). The patterns for the two dialogues are different from each other. Which dialogue was heard first or second or who they were spoken by does not seem to be influential in the scores.

4.3.4 Talkers

The main effect for talkers is not significant (p=.6197). The interactions for error by talker (p=0.0) and undererror by talker (p=0.0) are significant; however, neither talker scores consistently higher or lower in these results as Figures 11 and 12 illustrate. These results are discussed in section 4.3.5 and 4.3.6.

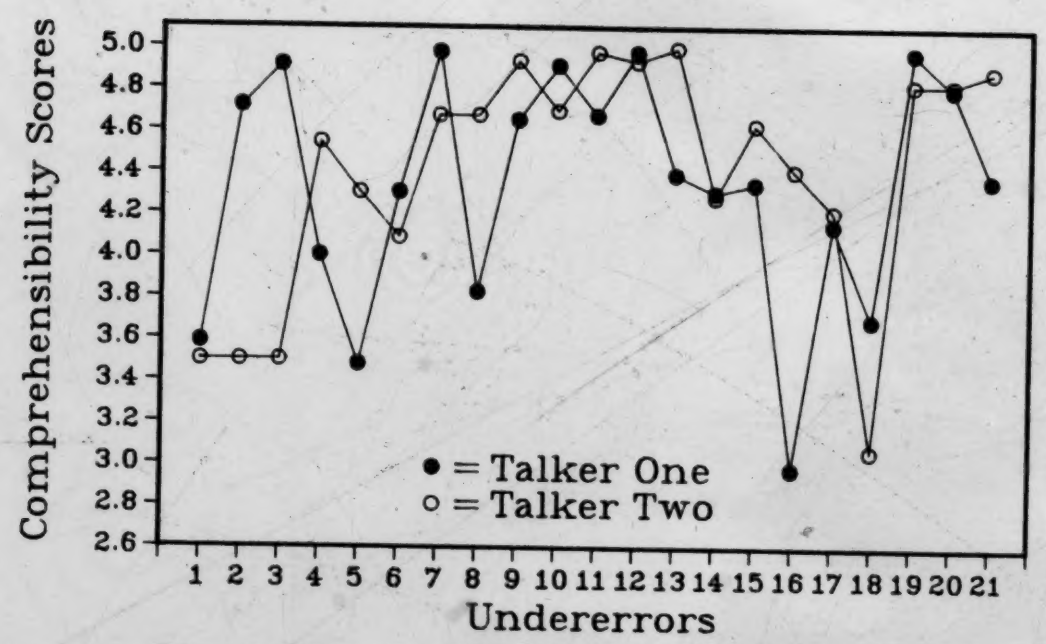

Figure 10a. Comprehensibility – Group One Group by Undererror by Talker Interaction

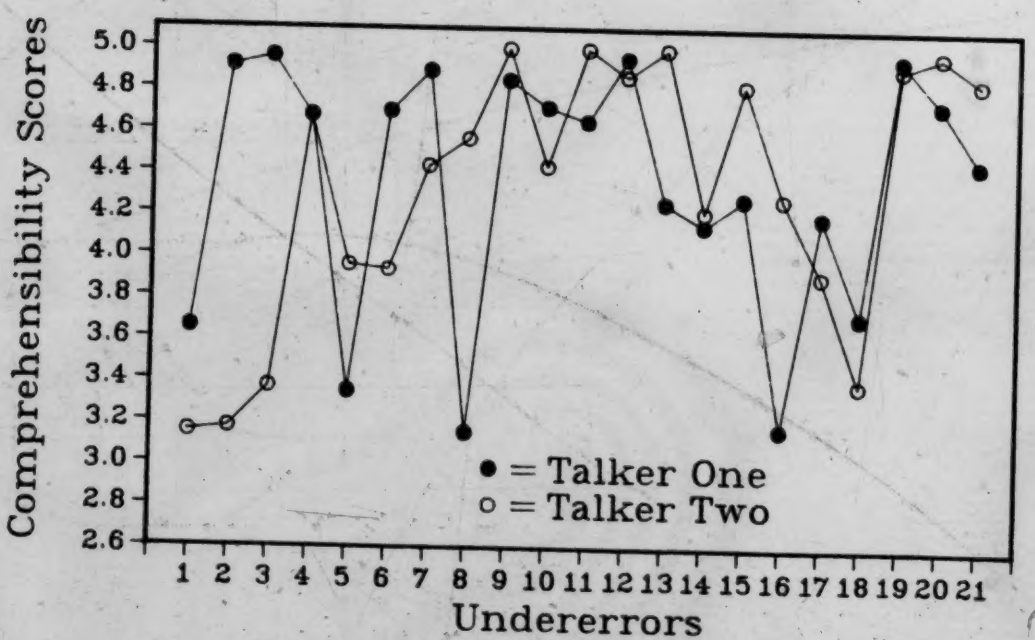

Figure 10b. Comprehensibility – Group Two Group by Undererror by Talker Interaction

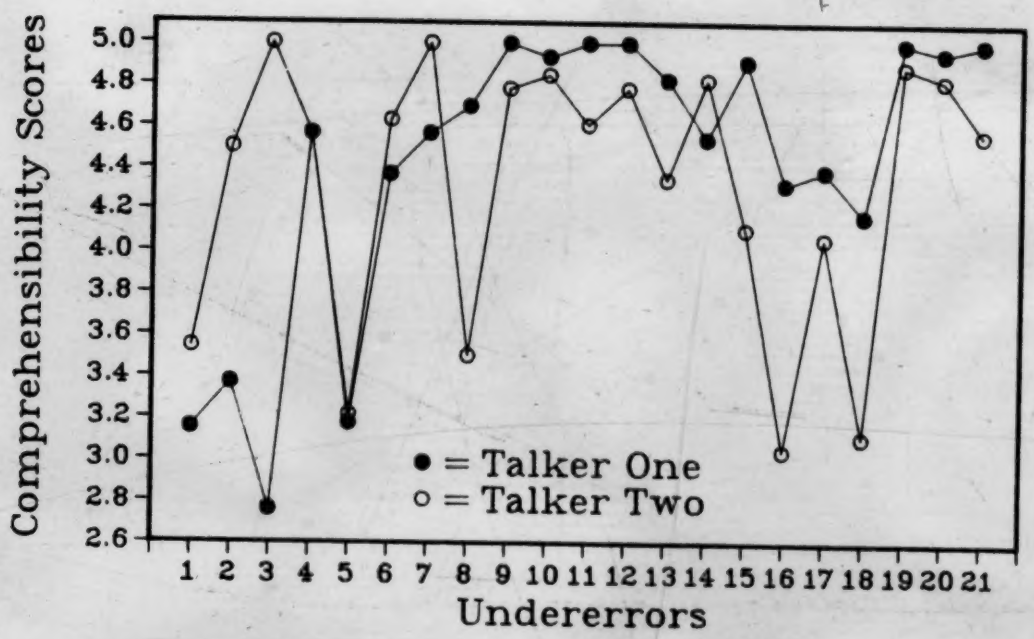

Figure 10c. Comprehensibility – Group Three Group by Undererror by Talker Interaction

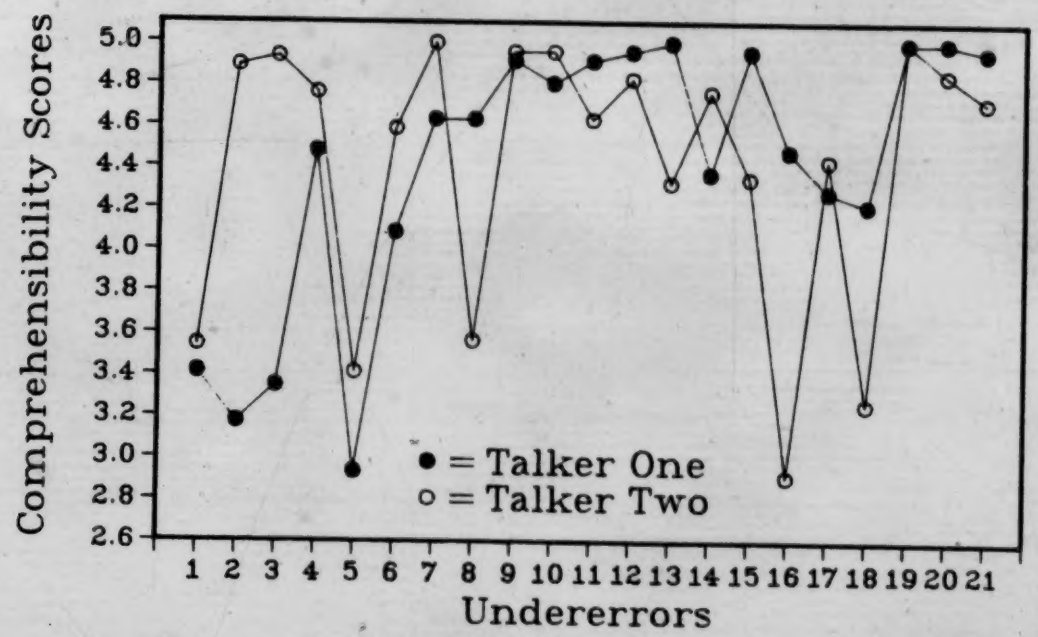

Figure 10d. Comprehensibility – Group Four Group by Undererror by Talker Interaction

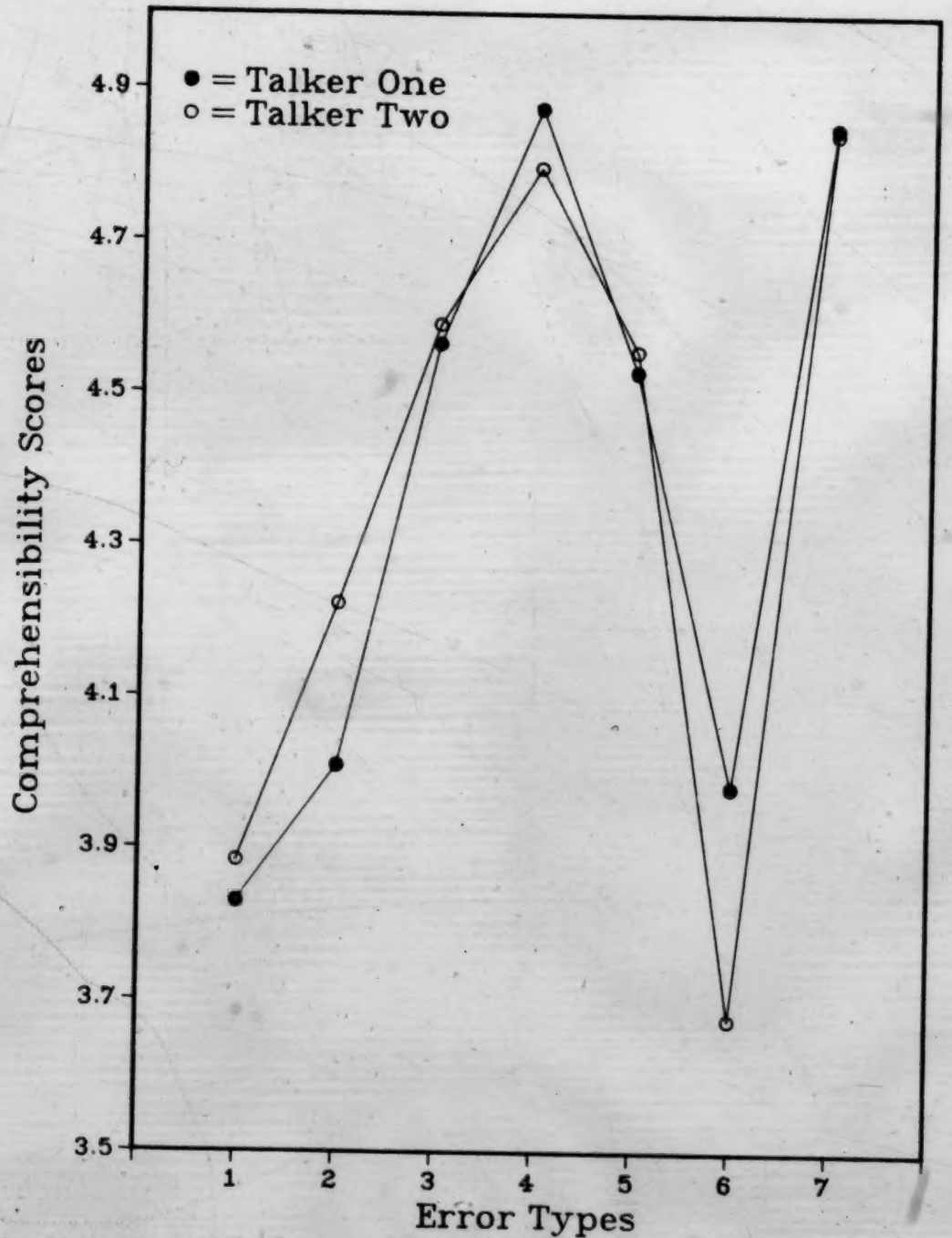

Figure 11. Comprehensiility – Error by Talker Interaction

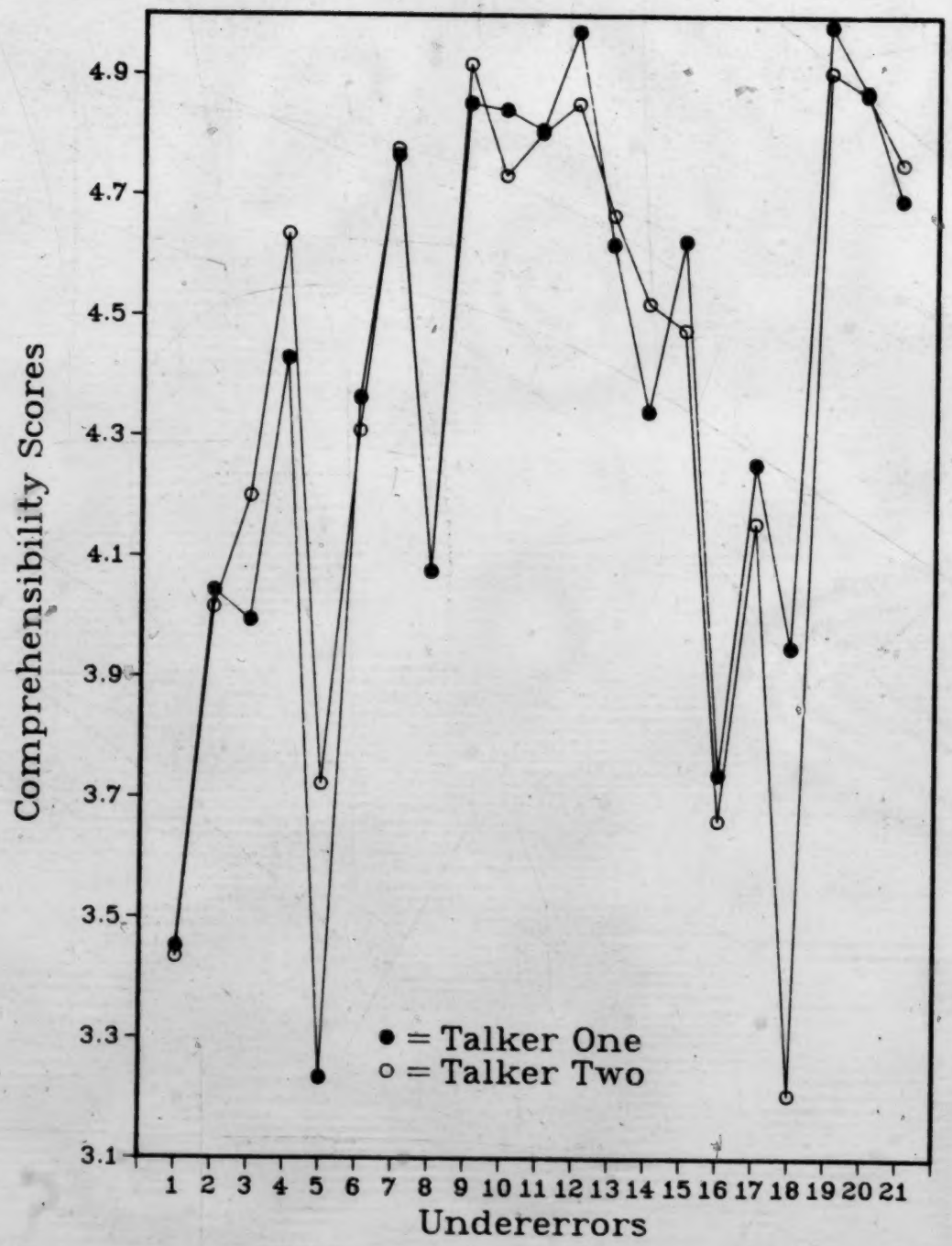

Figure 12. Comprehensibility – Undererror by Talker Interaction

4.3.5 Error Types

The error by talker interaction (p=0.0) is significant for comprehensibility. The differences caused by the two talkers occur at the upper and lower ends of the rank ordered list in Table VIII. Talker one scored highest on the function word error type and second highest on the errorfree sentences while this order is reversed for talker two; however, tukey tests show that for both talkers these two error types are not significantly different. Talker two scored lowest on multiple errors and second lowest on major constituent errors. In the talker one scores, this order is reversed; however, for talker one, these two error types are not significantly different. In both talkers' scores, verb morphology and inflections are similar. For talker one the content word error type and multiple error type are not significantly different. For talker two, however, the three lowest scoring error types are all significantly different from each other. According to tukey tests done on pairs of undererror means for each talker (see Table X in section 4.3.6) the errorfree, function word and inflection undererrors function cohesively; that is, the undererrors under each of these error types are not significantly different from each other. The undererrors under the remaining four error types do differ from each other.

The main effect for errors is significant (p=0.0). Error types account for the greatest proportion of variation. The scores for the main effect give a general

Table VIII. Error by Talker - Comprehensibility Scores and Tukey Test Results

Talker One		Talker Two	
FW	4.87500	EF	4.84420
EF	4.85145	FW	4.76710
VM	4.56522	VM	4.59058
INFL	4.52899	INFL	4.55616
CW	4.00906	CW	4.22283
Mult	3.98188	MC	3.88406
MC	3.82971	Mult	3.67572

[Not significantly different by tukey tests

The error abbreviations are shown in full form in Table 1.

summary of the similarity between talker one and talker two on error type scores. Table IX and Figure 13 represent these results.

4.3.6 Undererrors

The undererror by talker interaction is significant (p=0.0). This interaction addresses itself to two of the questions this experimental design endevors to answer, effect of error and effect of accent on comprehensibility. Table X is a rank ordered list of the undererror by talker scores. Tukey tests done for each talker reveal that the two talkers are quite similar but the different undererrors produce different results. For talker one errorfree, function word and two of the verb morphology undererrors (Modal and Tense) group together. The inflection and two of the content word undererrors (WV and OmNnAdj) produced similar results. Mult3 errors, the remaining verb morphology error (Part) and two of the major constituent undererrors (WO and Rep) grouped together. Mult2 and Mult5 produced similar results. The two undererrors receiving the lowest scores, Npar and WN were not significantly different from each other. For talker two, the results are quite similar; the highest grouping is the same as for talker one (errorfree, function word, Modal and Tense); however, for talker two this grouping is not significantly different from Pl, WV and 3rdPS undererrors. Inflection and WV undererrors are not significantly different. OmNnAdj, two of the major

Table IX. Error Types - Comprehensibility Scores and Tukey Test Results

Errorfree	4.84783
Function Words	4.83605
Verb Morphology	4.57790
Inflections	4.54257
Content Words	4.11594
Major Constituents	3.85688
Multiple Errors	3.82880

Errorfree, Function Words, Verb Morphology, Inflections: Not significantly different by tukey tests

Verb Morphology, Inflections, Content Words: Not significantly different by tukey tests

Content Words, Major Constituents, Multiple Errors: Not significantly different by tukey tests

The error abbreviations are shown in full form in Table 1.

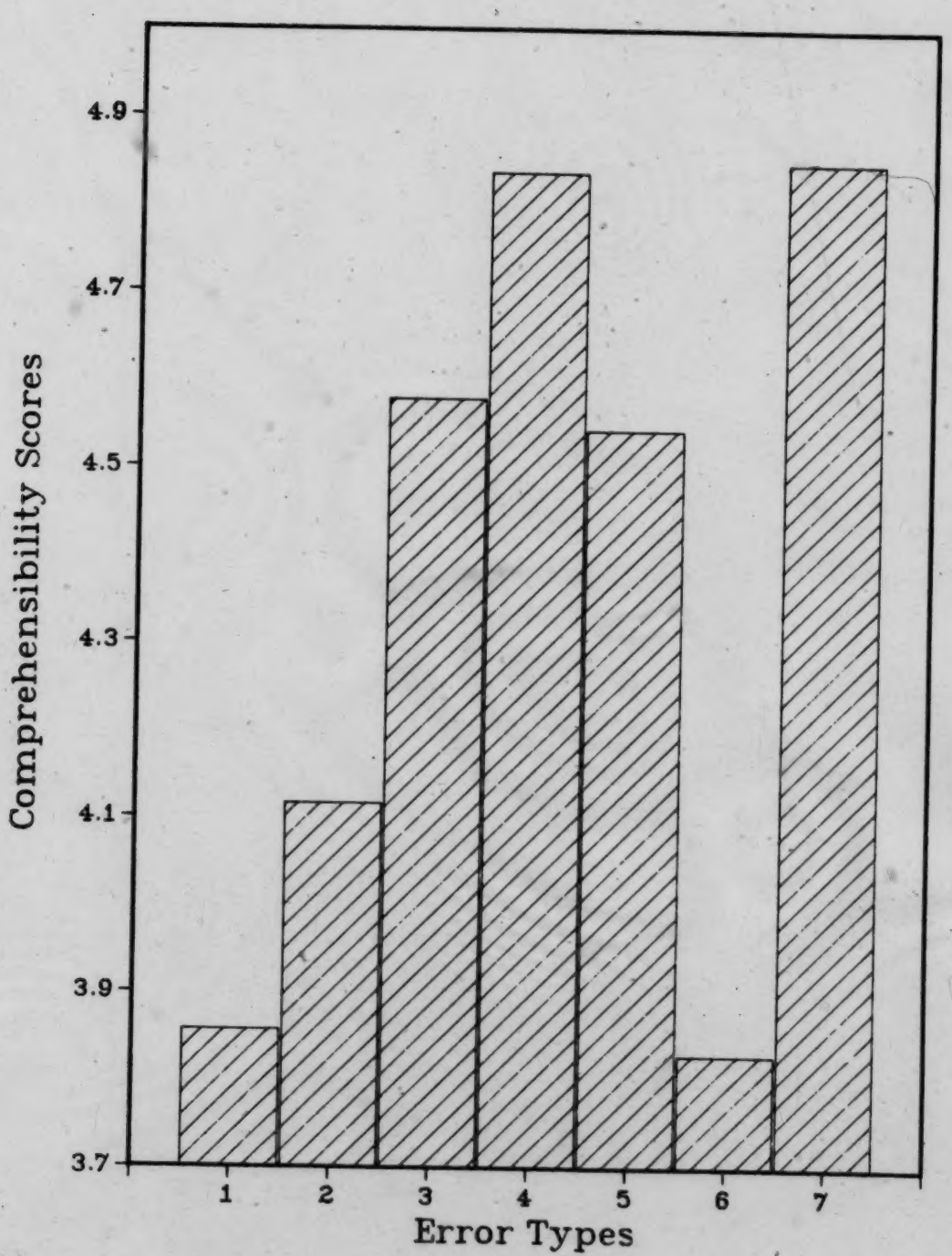

Figure 13. Comprehensibility – Error Types – Main Effect

Table X. Undererror by Talker - Comprehensibility Scores and Tukey Test Results

Talker One		Talker Two	
EF1	4.98370	Tense	4.91848
Prep	4.97283	EF1	4.90761
EF2	4.87500	EF2	4.86957
Tense	4.85326	Prep	4.85326
Pron	4.84239	Art	4.80435
Art	4.80978	Modal	4.77717
Modal	4.76630	EF3	4.75543
EF3	4.69565	Pron	4.73370
Der	4.62500	Pl	4.66848
Pl	4.61457	WV	4.63587
WV	4.42935	3rdPS	4.52174
OmNnAdj	4.36413	Der	4.47826
3rdPS	4.34239	OmNnAdj	4.30978
Mult3	4.25543	Rep	4.20109
Part	4.07609	Mult3	4.15761
WO	4.04348	Part	4.07609
Rep	3.99457	WO	4.01630
Mult5	3.95109	WN	3.72283
Mult2	3.73913	Mult2	3.66304
Npar	3.45109	Npar	3.43478
WN	3.23370	Mult5	3.20652

[Not significantly different by tukey tests

The error abbreviations are shown in full form in Table 1.

constituent undererrors (Rep and WO), Mult3 and Part function similarly. The lowest four for talker two are the same as for talker one; however, the two significantly different groups they form are not divided in the same way. For talker two, WN and Mult2 are not significantly different and Npar and Mult5 are similar. The results for these two talkers in terms of undererrors are similar; only minor variations are evident. There is a definite hierarchy in the extent to which different errors affect comprehensibility and certain undererrors, although belonging to different error types, appear to have the same effect.

The main effect for undererrors is significant ($p=0.0$) and summarizes the similarities between the two talkers' undererror scores. The scores for the undererror main effect are represented in Table XI and Figure 14. Tukey tests reveal that all of the errorfree, function word errors and two of the verb morphology undererrors (Modal and Tense) produce similar results. The inflection undererrors and WV function similarly. OmNnAdj and Mult3 achieve similar scores. WO, Part and Rep function similarly. Mult2, Mult5 and WN produce similar results. Npar, achieving the lowest score is not significantly different from WN or Mult5.

Table XI. Undererrors - Comprehensibility Scores and Tukey Test Results

EF1	4.94565
Prep	4.91304
Tense	4.88587
EF2	4.87228
Art	4.80707
Pron	4.78804
Modal	4.77174
EF3	4.72554
Pl	4.64402
Der	4.55163
WV	4.53261
3rdPS	4.43207
OmNnAdj	4.33696
Mult3	4.20652
Rep	4.09783
Part	4.07609
WO	4.02989
Mult2	3.07109
Mult5	3.57880
WN	3.47826
Npar	3.44293

[Not significantly different by tukey tests

The error abbreviations are shown in full form in Table 1.

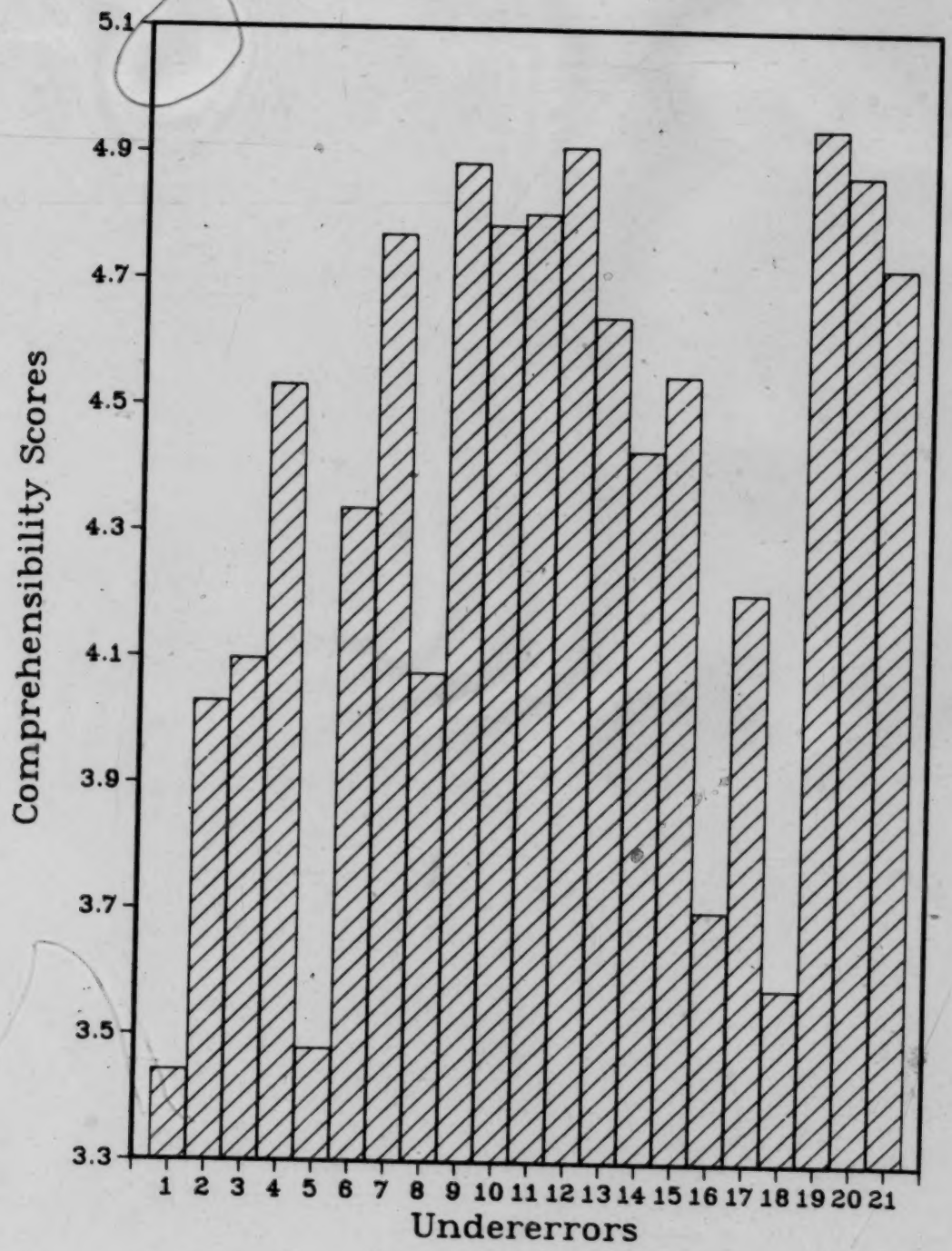

Figure 14. Comprehensibility – Undererrors – Main Effect

4.4 Correlation

4.4.1 Introduction

The results for the affective reaction scores and the comprehensibility scores were correlated using the Midas Interactive Data Analysis System. All of the scores for each subject (two replications of all twenty-one undererrors for two talkers, for ninety-two subjects) for affective reaction and comprehensibility were correlated. The overall scores for each undererror type for each talker were also correlated. Various results from the separate analyses of the two measures are also compared and discussed.

4.4.2 Midas Correlation

The correlation of every score for each subject (7728 scores for each measure) results in a positive correlation. The critical value of the correlation coefficient at .01 is .0293. The correlation between negative reaction and comprehensibility is .4348. Thus there is a significantly positive correlation for all of the subjects' scores. This indicates that the subjects' two measures of a specific utterance are consistent in relation to each other to some extent, indicating that the comprehensibility of an utterance influenced the subjects' affective reaction judgements. However, this relationship only accounts for approximately nineteen percent (.4348 squared) of the correlation. Thus, affective reaction was not entirely determined by the comprehensibility of an utterance.

The scores for the undererror by talker interactions (42 scores for each measure) were correlated in the same manner. The critical value of the correlation coefficient at .01 in this case is .3932. The correlation between affective reaction and comprehensibility is .4348. Again there is a significantly positive correlation. Figure 15 is a scattergram of this correlation. A positive trend is evident. However, this positive correlation only accounts for about nineteen percent (.4348 squared) of the relationship. Thus other unknown factors are also influential.

4.4.3 Other Comparisons

Comparing the results from the separate analyses shows that the affective reaction scores and the comprehensibility scores both produce a significant main effect for subjects. In the affective reaction scores, subjects accounted for the greatest proportion of variance; subjects did not vary as greatly in the comprehensibility scores. Comparing the bar graphs in Figures 1 and 8 it is easy to observe greater variation in the affective reaction scores and more homogeneity in the comprehensibility scores. This suggests that the effect which errors had on subjective reaction judgements depended on the individual subject, while the effect of errors on comprehensibility were relatively consistent for subjects. The subject by talker interaction is significant in the affective reaction results but is not

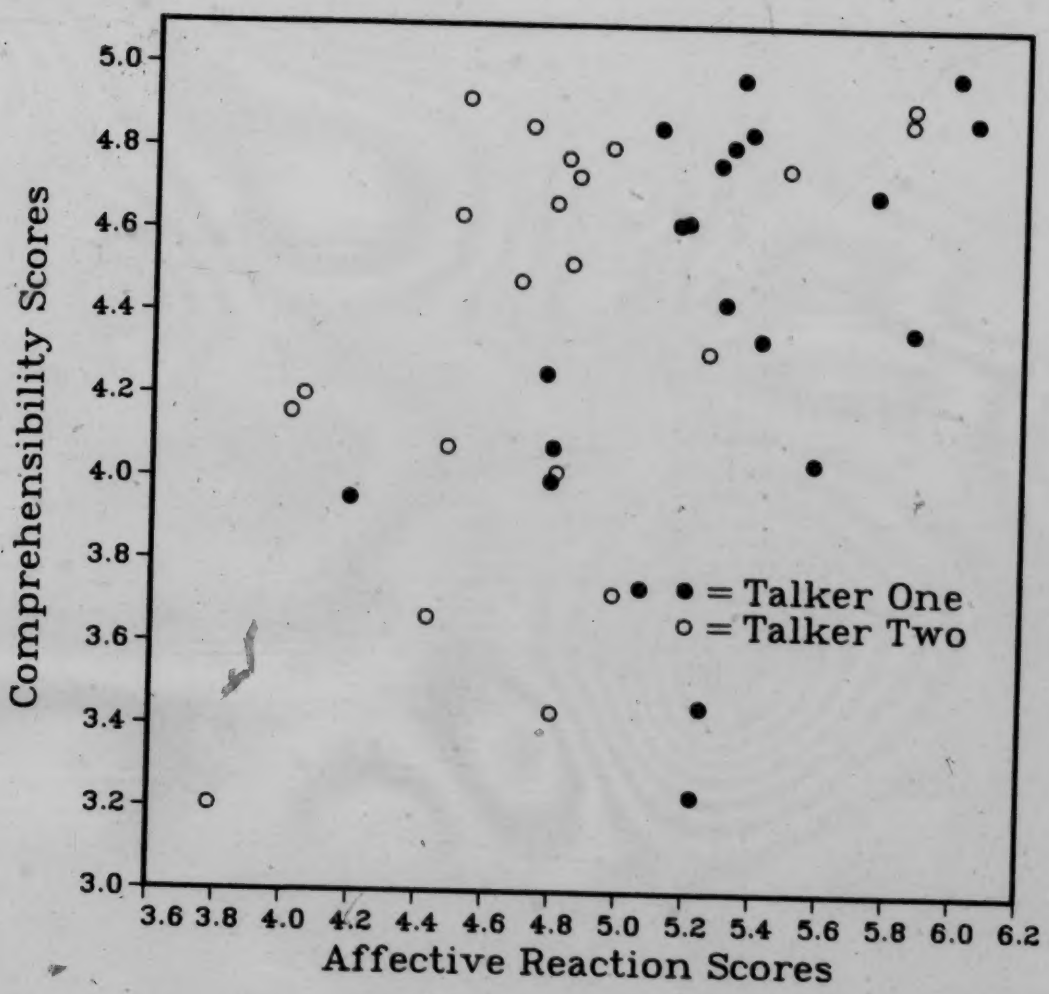

Figure 15. Correlation –
Undererror by Talker
Affective Reaction and Comprehensibility

significant in the comprehensibilty results.

The different subject groups also produced more variation in the negative reaction scores than in the comprehensibility scores. Comparing Figures 3a-3d and 10a-10d, affective reaction and comprehensibility scores respectively, it appears that the different presentations and the order had less of an effect on comprehensibility. The fact that the main effect for talkers was not significant for the comprehensibility scores but is significant for affective reaction scores adds further evidence that comprehensibility is determined in a more straightforward and homogeneous manner than affective reaction judgements.

In order to simplify the comparison between error types and undererrors, the main effects will be discussed rather that the interactions with talker, inasmuch as they are a summary of the talker interaction similarities. There is a larger number of significantly different groupings in the affective reaction results than in the comprehensibility results. Comparing the results for the seven error types (Tables IV and IX) reveals similarities but also a certain amount of difference. The ends of the two scales are identical and the placement of the remaining error types is similar except for two types, content words and verb morphology. Content words cause a comparatively large amount of miscomprehension; however, they are rated second highest in terms of affective reaction scores. On the other hand,

verb morphology errors cause a minor amount of miscomprehension, while they receive the second to lowest negative reaction scores. A comparison of the error by talker interaction agrees with the above comparison with the exception of one point (see Tables III and VIII). In the results for talker two there are more significantly different groupings for comprehensibility than for affective reaction.

Comparing the scores for the undererrors (Tables VI and XI) reveals a similar situation. All of the errorfree undererrors were scored high and the multiple errors low for both measures. Function word errors were scored higher on comprehensibility scores than negative reaction scores. Inflection error scores were all rated in the mid-range in both measures. Except for multiple errors, the suberrors in the aforementioned error types are not significantly different from each other in the negative reaction or the comprehensibility scoring. Multiple errors are significantly different from one another; however, they all occur toward the lower end of both groups. Content word errors are spread over the scale for both measures. OmNnAdj was scored highest in the negative reaction results with WN next and WV receiving the lowest score for this error type. In comprehensibility WV scored highest with OmNnAdj next and WN lowest. Verb morphology undererrors are also spread throughout both scales; however in the negative reaction scores they do occur in the mid to low parts of the scale.

From highest to lowest, the order for negative reaction is Modal, Tense and Part. For comprehensibility the order is Tense, Modal and Part. In both measures Part scored very low and, in terms of tukey test groupings, in the same position. The major constituent undererrors are spread over the affective reaction scale with WO occurring near the top, Npar next and Rep very near to the bottom. In the comprehensibility scores, the major constituent undererrors all occurred near the lower end of the scale in the order Rep, WO and Npar.

5. DISCUSSION AND CONCLUSIONS

5.1 Discussion

The results for the affective reaction task and the comprehensibility task, as well as the correlation results between the results of the two tasks, reveal that the hypotheses put forward are confirmed, and the questions which the experiment is designed to answer can be answered.

Subjects varied quite widely in their responses in the affective reaction task. This can be attributed only to individual strategies. As stated before, the information gathered cannot account for the variation. It is possible that the ambiguity of the instructions - that is, not specifying exactly how the subjects should approach the judging task - could have allowed for or even produced the variation. However, a set criterion for judgement could equally have excluded subjects who would not naturally use that criterion. Whatever the case, subjects differ widely in how negative a reaction they have to certain errors. The attitude which the subjects had toward the experiment in general could also have been an influence in making the affective reaction judgements, e.g., interest or disinterest in the subject of the study, or course workload at the time of the experiment. Post-experiment subject interviews would have been beneficial in this respect.

Subjects did not vary as greatly in how well they comprehended the sentences. The effect which errors have on comprehensibility seems to be much less subject to individual variation. Comprehensibility is perhaps is more a function of the language structure, and affective reaction more of an individual judgement. The degree of foreignness of the talkers' accents seemed to influence affective reaction judgements to a different extent in different subjects. For some subjects, perhaps, accent was not a factor in determining an affective reaction judgement, while for other subjects it was influential. The different talkers did not have a significant effect on comprehensibility for individual subjects. Again, comprehensibility appears to be affected more by the language itself than by extraneous factors.

The different groups of subjects (according to order and presentation combinations) also had more of an effect in the affective reaction scores than the comprehensibility scores. Within both tasks the scores for the dialogues, regardless of talker, were similar. The talker and the order of the presentations did not influence the comprehensibility scores, but the affective reaction scores were affected. Talker one received higher scores when he was heard second than when he was heard first. Perhaps in comparison to talker two he sounded more nativelike to the subjects than when no comparison was possible (i.e., when he was heard first). Talker two received higher scores when he was heard

first than when he was heard second. When comparison to talker one was possible perhaps talker two was judged more severely. The fact that there is a difference between the two dialogues in both tasks indicates that the context and content of a sentence is an influence on the effect produced by an error. Perhaps it cannot be assumed that the same undererrors in the two dialogues provide replications of each other.

There is also a major difference in the effect the two talkers had on the scores in the two tasks. In the affective reaction scores talker one scored higher than talker two overall, on all seven error types and all twenty-one undererrors. Neither talker scored consistently higher than the other in any category in the comprehensibility scores. Thus, again, comprehensibility is determined in a straightforward way, i.e., by the effect of the errors, whereas affective reaction is subject to a number of factors, i.e., individual subject, the talker, and the order of talker and dialogue.

It should be pointed out again that neither talker's accent interfered with comprehensibility directly; that is, neither's pronunciation of English resulted in his utterances being non-understandable. This is confirmed in the comprehensibility scores. However, the degree to which an accent deviates from native English pronunciation does have an effect on subjects' subjective reactions. More nativelike pronunciation is more favorably judged. In terms

of affective reaction judgements, the results for the error by talker interaction do not reveal any major differences between talkers, except that talker one scored consistently higher than talker two. In the undererror by talker interaction the major difference between the two talkers is that talker two elicited a wider range of judgements; his productions yielded more significantly different groupings. Perhaps errors were noticed more when uttered by talker two, and thus a greater range of judgements was needed. The fact that talker one was scored higher than talker two on the errorfree type, as well as the specific errorfree undererrors, indicates that the difference in talkers alone, i.e., apart from errors, affected the subjects.

The seven error types had an effect on the results produced by both tasks. In the affective reaction scores the errorfree sentences received the highest score. In a sense these sentences were included as a sort of control, or measure of validity. Since errorfree sentences received the highest scores, it can be assumed that it is the errors in the sentences which had the main effect on the subjects' reaction as opposed to sentence length, content etc.. Content word errors were the next highest scored type. This confirms that content words are high information carriers. When it is realized that in terms of comprehensibility these sentences received low scores, it seems that the erroneous content words were taken at face value. The sentences were interpreted as if the content words chosen carried the

intended meaning, sometimes even if this meaning were illogical or strange. Thus, the content word errors were often not interpreted as errors; this perhaps accounts for their high affective reaction scores. Function word errors and inflectional errors follow next in the affective reaction scores. These errors were noticed, then, (whereas content word errors were not) but were not reacted to negatively. Major constituent errors and verb morphology errors received the second to lowest affective reaction scores. Both these error types are very noticeable, i.e., the deviance from native English is quite marked and it is unlikely a native English speaker would make these errors, whereas the function word and inflection errors could perhaps be performance errors made by native English speakers. Multiple errors received the lowest affective reaction score. Again, it is unlikely these sentences would be uttered by a native English speaker. These sentences also received the lowest comprehensibility scores. A possible conclusion about the overall criterion for the affective reaction scoring is that it was a reaction to how much the sentences or the errors contained in these sentences deviated from normal native English, i.e., the foreignness of the utterance, or how likely it is that the utterance could have been spoken by a native English speaker. For the comprehensibility scores the higher and lower ends of the scale are the same as the affective reaction scores, i.e., errorfree is the highest and multiple errors are the lowest.

Function word errors are not significantly different from errorfree sentences in terms of comprehensibility. Thus, we can assume function words carry little or none of the meaning, or at least the meaning they carry is redundant and can be interpreted from the remainder of the sentence. This agrees with the view of language as an information code, where check items (e.g., function words) are redundant and can be omitted. Verb morphology and inflection errors followed next; thus, although verb morphology errors received low affective reaction scores, comprehensibility was not greatly affected by them. Both of these error types are similar in involving only parts of words, i.e., affixes; it is interesting that their effect on comprehensibility is also similar. All of these error types can be categorized as check items, as they generally carry redundant information. Beckmann (1972), in speaking of language as an information code, states that these check morphemes can be omitted and will not result in loss of information if the remaining information is clear (i.e., unambiguous). As discussed above, content word errors received relatively low comprehensibility scores. It appears these errors were interpreted as if they were intended. However, their meanings were not the intended meanings; therefore, a lot of miscomprehension actually occurred. Because of the format of the dialogues, perhaps, these miscomprehensions were not realized as the dialogue progressed. Or, because the subjects' were not engaged in the conversation the

miscomprehensions were not later discovered. Major constituent errors and multiple errors turned out to be the causes of the most miscomprehension. It must be pointed out, though, that even the lowest comprehension score (multiple errors) is 3.8288. In terms of what this error corresponds to, not too much of the message was missed. This score falls close to the score given for a minor misunderstanding (4) and well above the score for the main idea still being understood even if misunderstanding occurred (3). Thus, none of the errors had a severe effect on comprehensibility. This could be due to the contextualization of the sentences; the context provided the missing, or corrected the erroneous information.

Only the errorfree, function word and inflection error types functioned similarly (i.e., their undererrors are not significantly different from each other). The undererrors for the other types varied extensively. Thus, although these latter undererrors could be categorized similarly, their effects are not similar. Only these latter types will be discussed in terms of their undererrors.

Verb morphology errors did not produce similar results. Modal was scored in about the middle of the affective reaction scores while Tense and Part were scored fairly low. However, in terms of comprehensibility Tense and Modal caused no more miscomprehension than the errorfree sentences while Part errors scored low. All the Part errors involved the wrong choice between infinitive or gerund form, although

the choice of the base word was correct. Somehow the grammatical choices in these cases caused miscomprehension. The Tense and Modal errors also simply involved an erroneous grammatical choice while the lexical choices were correct. Perhaps in the case of Part the grammatical form is more an essential part of the lexical choice; i.e., *to work* and *working* are viewed as two separate lexical items while *arrive* and *arrived* are variations of one lexical choice. If this is the case, then as with content words, the choice is taken as given, its correctness is not questioned, and an erroneous interpretation is made. However, Part also received low affective reaction scores so its incorrectness is apparent.

The content word subtypes varied widely in their comprehensibility. WV with a score of 4.53261 and OmNnAdj with a score of 4.33696 both incurred a medium amount of incomprehensibility. WN errors had the second lowest score with 3.47826. Thus, it appears that verbs do not carry as much information as nouns. The intended verb was deciphered from the context; an erroneous choice was evident. The wrong noun, however, was taken as the intended choice and the interpretation was therefore erroneous. When a content word was left out it was apparently quite possible to fill it in according to the intended meaning, as the OmNnAdj results bear out. These results also confirm information coding theory suppositions. That is, although nouns, verbs and adjectives are usually information carrying segments, they

can be omitted (or erroneous) if their identity is sufficiently clear from the remaining check or redundant morphemes (Beckmann, 1972). It appears that this is not the case with a wrong choice of noun but is the case with a wrong choice of verb.

In terms of comprehensibility, the major constituent errors all scored quite low; Npar, in fact scored the lowest. Rep also scored low in the affective reaction results, overall and in comparison to Npar and WO. Thus, although all three major constituent undererrors hindered comprehensibility to a similar extent, Rep had a more adverse effect on affective reaction, perhaps because it interrupts syntactic structure to a greater extent. WO shows the greatest difference between the two test scores. Because WO is so important in conveying information in English (like the choice of a lexical item), it is also taken as given, so an erroneous interpretation results. Talker two scored lower on WO than talker one in the affective reaction results. Perhaps in the case of a more foreign sounding accent, the error was more evident. In the case of talker one, his more nativelike accent perhaps led to the assumption that his word order choice was intended.

Multiple errors scored low in the results for both tasks. For the affective reaction scores, the more errors the sentence had the lower it scored with Mult3 and Mult5 scoring the lowest of all the undererrors. In comprehensibility the multiple errors were not the lowest

and comprehensibility did not entirely depend on the number of errors as Mult3 scored higher then Mult2. Mult5 was still the lowest, however.

Two main results of this experiment, that multiple errors cause the most miscomprehension, and that content word errors also cause a relatively great amount of miscomprehension, agree with Johansson's and Olsson's studies in English. Johansson also found in one of his studies that word order errors were less severe than verb agreement or verb complementation errors in terms of irritation. It is difficult to match the latter two error types with error types in the present study; however, word order is also one of the less severe errors in this study for affective reaction.

The validity of comparing the results of the present study to results from studies of languages other than English is debatable. Naturally, many of the results are dependent on the specific language's structure; however, if there are similarities, consideration of them may be interesting.

Since the number and type of errors used in the studies are different, only general results can be compared. Both Chastain and Guntermann's studies in Spanish revealed that the least severe errors in terms of comprehensibility involved redundancies. The results of the present study could support this. The comprehensible errors generally involved function words or inflectional aspects, whereas

more severe errors tended to involve entire words or clauses. Chastain concluded that lexical errors are more severe than grammatical errors as did Johansson's and Olsson's studies. As stated above, the present study also supports this. Politzer's study in German also supports this finding. Piazza, in her study of French, compared her results for comprehensibility and irritation, and found that those errors which caused more miscomprehension tended to be those which were more irritating. The correlation results for the present study also support this tendency.

5.2 Conclusion

This experiment was designed to provide insight into, or answers to, the following four sets of questions. Which errors hinder comprehensibility most, and is there any similarity among errors which do/do not hinder comprehensibility? Which errors provoke a more negative reaction and is there any similarity among errors which do/do not provoke a negative reaction? Is there any correlation between those errors which hinder comprehension and those which provoke a negative reaction? Does the degree of foreignness of an accent have an effect on comprehensibility or affective reaction?

In answer to the first question, multiple errors, errors involving entire words or clauses, such as word order, repetition and nonparallelism and errors involving the choice of content words, most notably nouns, caused the

most miscomprehension. Errors involving function words and morphology hindered comprehension the least. This pattern is supported by other studies; errors involving lexical items (and larger constituents) hinder comprehension more than grammatical errors.

The errors which provoked the most negative reaction were multiple errors, errors involving the verb, and repetition. Those which did not provoke a negative reaction were lexical item errors, function word errors, inflectional errors and word order errors. A pattern in this case is difficult to detect. Possibly, those errors which could also be made by a native English speaker, or those errors which still resulted in a grammatical sentence (in the linguistic sense of the word), although the interpretation of the resulting sentence would not be the intended sentence (such as failing to invert the subject and verb in a question), were more acceptable. More nativelike errors were judged less severely than errors which a native speaker would be unlikely to make. This assumption is further supported by the fact that the more nativelike speaker in terms of accent also received higher affective reaction scores.

The statistics show a positive correlation between the affective reaction scores and the comprehensibility scores. Thus, errors which hinder comprehensibility are also judged more severely in terms of affective reaction. However, if the error in a sentence still results in a nativelike sentence, it tends to receive a higher affective reaction

score, e.g. word order. The subjects concentrated more on how the sentence sounded than what it meant. Conversely, if a sentence is still comprehensible but is very non-nativelike, e.g., wrong verb or tense, it receives a lower affective reaction score.

The degree of accent is a factor in the affective reaction score. A stronger accent produced a lower affective reaction score. Comprehensibility was not affected by accent to as great an extent, however. Talker two did incur more miscomprehension, as the lowest score on error types for talker one is 3.82871 (MC) and for talker two is 3.67572 (Mult). For undererror scores, however, the lowest scores are quite similar.

These results can be incorporated into the teaching and learning of English as a second language quite readily. The communicative approach to language acquisition focuses on providing learners with the ability to communicate. This amounts to more of a focus on appropriate language for various situations and less on grammatical accuracy. The fact that errors involving words and larger constituents caused the most miscomprehension, and function word and inflectional errors caused the least miscomprehension suggests that it is the former group which need emphasis. In terms of the goals of the communicative approach, this emphasis is easily instituted. To provide students with the language needed to function in various situations, vocabulary building and basic sentence structures are

essential. On the other hand, the correct choice of preposition or article is generally not as important. The fact that multiple errors cause a significant amount of miscomprehension is not easily remedied. However, a learner's degree of comfort with the language may result in fewer errors being made overall, and therefore fewer errors per sentence. The communicative approach can also cater to this goal as it strives to enable the students to function in situations in which the second language is needed. Thus the student may feel more confident in his language abilities and not be as prone to making errors.

In terms of viewing language as an information carrying code the results of this study suggest that it is the larger constituents that carry more of the essential information, and that the redundant elements can often be erroneous or omitted without any effect on comprehension. Studies of this sort support the utility of viewing language as an information carrying code, and give us specific information as to the weights assigned to various elements (or operations in the coding of various language elements). This demonstrates the value of studies in the applied field to basic psycholinguistic research.

5.3 Suggestions for Further Research

In this experiment one of the writer's main goals was to present the subjects with a realistic, natural language situation. In achieving this, however, certain measures had

to be sacrificed. The stimulus sentences were not necessarily of exactly similar length, structure or content. To purely compare the errors, all errors should occur in similar structural and semantic situation. In the present study, some errors occurred in non-essential parts of the sentence, that is, if the error caused miscomprehension the meaning of the whole sentence was not greatly affected. Some of the sentences were also easier to interpret from the surrounding context than others. Although naturalness is important, especially when attempting to apply results practically, the controls mentioned above are perhaps equally important in terms of validity of results. Thus, in further experimentation a degree of naturalness might be sacrificed to achieve more comparable variables.

Some of the interpretations and errors left unaltered (and introduced) by subjects in this experiment could have been due to fatigue and boredom rather than being a reflection of their language judgements and abilities. The duration of the experiment should have been shortened to prevent this interference even at the expense of a smaller corpus of errors. In addition, some of the sentences were very long, thus incorrect interpretation could have been due to incorrect recall rather than the effect of the error.

Nevertheless, the results of this experiment do provide insight into the effects of errors on communication. The results answer important pedagogical and linguistic questions and have added to the body of knowledge on this

topic.

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APPENDIX A. Dialogues

Dialogue One

WHERE ARE YOU FROM?

1. I'm from Argentina, my parents immigrate there from Italy. (Tense)

DO YOU HAVE ANY RELATIVES HERE?

2. Just in Canada I have a cousin, she's married with a Canadian citizen. (Mult3)

DID YOU LIVE IN BUENOS AIRES?

3. No, Rosario, the second city. (OMNnAdj)

WHERE'S THAT?

4. It's about 2 hours from Buenos Aires and 2 hours to Cordoba. (NPAR)

HOW DO YOU LIKE CANADA?

5. I like it, the winter bothers a little but that's OK. (Pron)

6. I go holidays every winter. (Prep)

THAT'S A GOOD WAY TO DEAL WITH IT. WHERE ARE YOU GOING THIS YEAR?

7. I'm going to Brazil, in the limit with Argentina. (Mult2)

8. Because when here it is winter, there it is summer. (WO)

DOES IT EVER GET COLD IN ARGENTINA?

9. Yes, in the south because Argentina is big, like the States. (EF3)

10. In the south it is hot like Los Angeles, and they have Chicago where it is cold. (NPAR)

HOW LONG ARE YOU GOING FOR?

11. Well, probably stay there for a month. (Pron)

HOW WOULD YOU COMPARE THE SOUTH AMERICAN COUNTRIES, ARE THEY SIMILAR?

12. Their cultures are all based on the Spanish and the Indian culture, but there are differences too. (Pl)

LIKE WHAT?

13. Argentina, Brazil and Venezuela are different because they have better researches now. (WN)

14. The people are different too. (EF1)

15. In Argentina there are more Europeans, so they think different than Chileans for example. (Der)

16. Most of the South American are part Indian. (OMNnAdj)

ARE SOUTH AMERICAN INDIANS SIMILAR TO NORTH AMERICAN INDIANS?

17. No, here the government pay them, in South America the government doesn't. (3rdPS)

18. In South America the Indians work on usually the farms. (WO)

WHY ARE YOU IN EDMONTON?

19. I'm visiting some people I know in Argentina. (Tense)

20. I also want to speak English because to learn English is more than just knowing the grammar. (PART)

HAVE YOU STUDIED ENGLISH BEFORE?

21. Yes, in the high school in my country, but I didn't learn much. (Art)

HAVE YOU TAKEN ANY ENGLISH COURSES HERE?

22. I take a couple of courses in Grant MacEwan. (Mult2 extra)

DID YOU LIKE THEM?

23. They were writing couses but all we did was write things at home. (EF3)

24. I didn't think this was the way, to write at home because I can use dictionary, for sure I used. (Mult5)

DO YOU HAVE ANY QUESTIONS ABOUT THIS COURSE?

25. I would like to know what is the strongest part of the course. (Mult2)

26. I need practice writing. (EF1)

27. I try to make my best but I need practice. (WV)

28. My problem is how the ideas come in my mind and to put them in order. (Mult3)

29. When I get an idea comes to my mind I have trouble writing it down. (REP)

30. That's my problem is getting it on paper. (REP)

WELL, I THINK THIS COURSE IS WHAT YOU WANT THEN.

ARE YOU DOING ANYTHING BESIDES STUDYING ENGLISH?

31. I am chemist but I don't have a job in chemistry. (Art)

32. I hope to get a chemist job, but I need to learn English first. (Der)

33. It seem English is the most important thing right now. (3rdPS)

ARE YOU WORKING AT ALL?

34. Yes, I'm working at a construction company, but I don't like to work there. (PART)

35. It's just because of the money. (Prep)

ARE YOU PLANNING TO STAY IN CANADA?

36. I think if I had the possibility to stay here, I would stay. (WN)

37. If I would have a good job I would stay. (Modal)

IF YOU WERE OFFERED A JOB SOMEWHERE ELSE IN CANADA, WOULD YOU ACCEPT IT?

38. If it would be a good job, why not? (Modal)

HAVE YOU BEEN TO VANCOUVER?

39. Yes, I've been there three time. (P1)

WHY ARE YOU TAKING THIS COURSE?

40. I'm thinking about going to the University. (EF2)

41. I took the TOEFL but I didn't pass it. (EF2)

42. I took a couple of auditing courses in the University and I pass it but I don't pass the TOEFL. (Mult5)

OK, YOU CAN REGISTER FOR THE COURSE TOMORROW.

43. Where do I see what level I have? (WV)

OUTSIDE THE GENERAL OFFICE.

Dialogue Two

WHERE ARE YOU FROM?

1. I'm from South America, from Chile. (EF2)

HOW LONG HAVE YOU BEEN HERE?

2. I've been here for 2 year. (P1)

WHY DID YOU COME TO CANADA?

3. Because there are better opportunity for business, for study, for all the things. (Mult3)

HOW DO YOU LIKE CANADA?

4. I like Alberta, is beautiful. (Pron)

5. The places, the mountains are different places from my country. (Npar)

6. I've met people from all the world. (Prep)

7. Someone tell me it seem like the Noah's Ark, not by the animals but by the people from all the world. (Mult5)

WHAT DO YOU THINK OF OUR WINTERS?

8. I don't mind them, we have hot and cold in my country too. (OMNnAdj)

DOES IT SNOW THERE?

9. Yes, in the southpole, but it's not as cold as here. (WN)

HAVE YOU SEEN OTHER PARTS OF CANADA?

10. I've been to Vancouver. (EF1)

IF YOU HAD A CHANCE TO MOVE THERE WOULD YOU?

11. I would consider. (Pron)

WHICH CITY DO YOU LIKE BETTER?

12. There are good thing here and there are good thing there. (Pl)

13. I won't compare them both the same. (REP)

14. In Vancouver there are many fun, more theatres and discoteques, in Edmonton, very few. (Mult5)

DO YOU MISS YOUR COUNTRY?

15. Yes, but I'm not desperately to go back. (Der)

WHY NOT?

16. In Chile, there are not many opportunities for everyone. (OMNnAdj)

17. Is better for me and my family living in Canada. (Mult2)

ARE YOU MARRIED?

18. Yes I've been married for 5 years. (EF3)

IS YOUR WIFE GOING TO STUDY ENGLISH TOO?

19. No, she has a job. (EF2)

20. She work fulltime, but she'll learn a lot of English at work. (3rdPS)

WHAT DID YOU DO IN CHILE?

21. I was student at university. (Art)

HAVE YOU COMPLETED YOUR STUDIES?

22. I've completed 2 years of the complete course of the course is 5 years. (REP)

WHAT WERE YOU STUDYING?

23. I was studying Education. (EF1)

DO YOU WANT TO FINISH YOUR STUDIES?

24. In this moment I just want to study English. (Prep)

IS THAT WHY YOU CAME TO CANADA?

25. Yes, I came to Canada to study the English. (Art)

HAVE YOU TAKEN ANY OTHER ENGLISH COURSES HERE?

26. I haven't studied English since I arrive in Canada. (Tense)

BUT YOU'VE STUDIED ENGLISH BEFORE?

27. I take a couple of courses in Chile. (Tense)

28. They weren't no good though, very deficient. (Mult2)

SO YOU KNEW SOME ENGLISH WHEN YOU ARRIVED?

29. I had some but I've learned most of it here. (WV)

30. Most of my English is just picking up since I came here. (PART)

WHEN YOU SPEAK ENGLISH WELL ENOUGH, DO YOU WANT TO GO TO THE UNIVERSITY?

31. I'm interesting in studying Education again, but we'll see. (Der)

WHAT DO YOU WANT MOST IN THIS COURSE?

32. I want for writing English. (PART)

33. Not just writing but compositions, the start, the body, the conclusion. (WN)

34. I also hope I sharpen the English I already have.(Modal)

HAVE YOU LIVED ANYWHERE ELSE IN SOUTH AMERICA BESIDES CHILE?

35. Yes, in Brazil, that's where I knew my wife. (WV)

DOES SHE SPEAK SPANISH OR DO YOU SPEAK PORTUGESE?

36. Well, she speak a mixture of Spanish and Portugese, like most Brazilians. (3rdPS)

37. We understand each other better than a person from Portugal. (Npar)

38. So we could talk to each other in our own languages. (Modal)

HOW DID YOU FIND OUT ABOUT OUR COURSE?

39. From the paper, it's expensive though. (EF3 extra)

40. It is worth it? (WO)

WE THINK SO. DO YOU HAVE ANY QUESTIONS ABOUT THE COURSE?

41. It is going to be only eight in the morning till twelve? (WO)

THE INTERMEDIATE COURSE IS IN THE AFTERNOON AND THE BEGINNERS AND ADVANCED COURSES ARE IN THE MORNING.

42. Which level will I be in? (EF3)

WE DON'T KNOW YET, WE'LL DECIDE THIS AFTERNOON AND YOU CAN REGISTER TOMORROW.

43. Where we are going to see the results are going to be? (Mult3)

OUTSIDE THE GENERAL OFFICE.

APPENDIX B. Subject Information Sheet

INFORMATION SHEET

1. What criteria did you use to rate the speakers on the negative-positive scale (Task A)?:

_____

2. Age: _

3. Sex: M F

4. Linguistics or Anthropological-linguistics courses taken/taking: _____

5. Other Languages known or studied:

None (go to #6)

For each other language you know/have studied other than English please indicate:
(a) how well you know it and
(b) how you learned it.

Language:_ _ _ _ _ _
(a) _poor _working knowledge _fluent
(b) _informally learned _formally learned

number of years studied or known: _

Language:_ _ _ _ _ _
(a) _poor _working knowledge _fluent
(b) _informally learned _formally learned

number of years studied or known: _

Language:_ _ _ _ _ _
(a) _poor _working knowledge _fluent
(b) _informally learned _formally learned

number of years studied or known: _

6. Language courses taking right now: _____

7. Comments about this study: _____

_____

_____

APPENDIX C. Subject Score Sheet

NATIVE ENGLISH SPEAKER REACTION TO ESL LEARNER ERRORS

Please read the following instructions carefully. If anything is unclear please ask for further explanation.

You will hear two taped interviews each between a native English speaker and an English learner. The original purpose of these interviews was to place these English learners at the appropriate level in English-as-a-Second-Language classes. Thus the questions and answers may not sound like a natural conversation, since the interviewee may have been trying to produce as much English as he knew.

You are required to perform two tasks on each taped interview. You will perform tasks A and B on the first tape and then perform tasks A and B on the second tape.

TASK A:

It has been observed that not all errors made by English learners are judged equivalently by listeners. Some errors provoke a more negative response than others.

Your task is to rate each sentence uttered by the foreign speaker on a scale of 1 to 7 in which 1 indicates a more negative reaction on your part, and 7 indicates a more positive reaction.

TAPE 1

1. 1 2 3 4 5 6 7
   negative positive

2. 1 2 3 4 5 6 7
   negative positive

.

.

.

43. 1 2 3 4 5 6 7
   negative positive

TASK B:

Your task is to write down what you think the foreign speaker was trying to say (or what a native speaker would have said) staying as close to the original as possible. If some responses need no changes, write down exactly what was said. In some cases it may be difficult to stay close to the original. If you feel more extensive rewording of the sentence is necessary you are welcome to do so. Before you write the sentence down, please indicate whether you think the sentence is OK or not by circling 'OK' or 'NOT OK'.

TAPE 1

1. OK / NOT OK_____

_____

2. OK / NOT OK_____

_____

.

.

.

43. OK / NOT OK_____

_____

TASK A:

It has been observed that not all errors made by English learners are judged equivalently by listeners. Some errors provoke a more negative response than others.

Your task is to rate each sentence uttered by the foreign speaker on a scale of 1 to 7 in which 1 indicates a more negative reaction on your part, and 7 indicates a more positive reaction.

TAPE 2

1. 1 2 3 4 5 6 7
negative positive

2. 1 2 3 4 5 6 7
negative positive

.

.

.

43. 1 2 3 4 5 6 7
negative positive

TASK B:

Your task is to write down what you think the foreign speaker was trying to say (or what a native speaker would have said) staying as close to the original as possible. If some responses need no changes, write down exactly what was said. In some cases it may be difficult to stay close to the original. If you feel more extensive rewording of the sentence is necessary you are welcome to do so. Before you write the sentence down, please indicate whether you think the sentence is OK or not by circling 'OK' or 'NOT OK'.

TAPE 2

1. OK / NOT OK_____

_____

2. OK / NOT OK_____

_____

.

.

.

43. OK / NOT OK_____

_____

APPENDIX D. BMDP 8V Program and Datafiles

BMDP PROGRAM

```
/ PROBLEM TITLE IS 'TITLE'.
/ INPUT VARIABLES ARE 12.
FORMAT IS FREE.
MTSFILE IS DATAFILE.
/ VARIABLE NAMES ARE U1T1R1, U1T1R2, U1T2R1, U1T2R2,
U2T1R1, U2T1R2, U2T2R1, U2T2R2,
U3T1R1, U3T1R2, U3T2R1, U3T2R2,
/ DESIGN LEVELS ARE 4, 23, 7, 3, 2, 2.
NAMES ARE GROUPS, SUBJECTS, ERRORS,
UNDERERRORS, TALKERS, REPLICATIONS.
FIXED ARE GROUPS, ERRORS, UNDERERRORS, TALKERS.
RANDOM ARE SUBJECTS, REPLICATIONS.
MODEL IS 'G, S(G), E, U(E), T, R(GSEUT)'.
PRINT = 'GSEUT'.
/ END
```

Datafiles

The numbers before each set of numbers refer to the subjects. The rows in each set of numbers correspond to the seven error types. The three columns of four numbers refer to the three suberrors for each error type. Within each column the first two numbers refer to speaker one, replications one and two, and the second two numbers refer

to speaker two, replication one and two.

Affective Reaction Scores	Comprehensibility Scores
1	1
7 5 4 3 6 5 7 6 3 5 3 3	5 1 3 3 5 5 1 3 5 5 1 5
5 3 6 5 4 5 6 4 6 5 3 5	5 5 5 5 3 5 1 4 5 3 3 4
4 7 2 4 6 7 3 3 6 5 4 4	5 5 5 5 1 5 5 5 5 5 5 5
5 7 5 6 5 7 5 6 5 6 5 4	5 5 5 5 5 5 5 5 5 5 5 5
7 6 6 4 7 4 5 5 6 6 5 3	3 5 5 5 5 4 3 5 1 5 5 5
6 4 6 2 7 4 2 5 4 3 4 3	4 2 5 4 4 5 5 4 4 4 2 5
7 7 7 6 6 3 7 7 4 6 7 7	5 5 5 5 4 5 5 5 2 5 5 5
2	2
5 4 4 5 4 5 5 5 6 6 3 2	5 2 5 3 5 5 1 5 5 5 1 5
6 6 5 3 3 5 5 4 5 4 4 5	5 4 3 5 1 5 5 5 5 5 5 3
5 6 4 5 4 6 5 3 6 3 6 4	5 5 5 5 5 5 5 3 5 5 5 5
5 6 5 6 6 5 5 6 4 5 3 4	5 5 5 5 4 5 5 5 5 5 5 5
6 4 5 4 3 6 5 4 6 5 4 3	5 5 5 5 5 3 4 5 5 3 5 5
6 4 5 2 6 7 4 6 4 4 5 3	4 2 5 4 5 3 5 4 5 3 5 4
6 6 6 6 6 4 5 5 4 4 6 6	5 5 5 5 5 5 5 5 5 5 5 5
3	3
6 6 5 5 5 5 6 5 5 5 4 5	5 1 1 3 5 5 1 3 5 4 1 5
6 4 6 5 6 4 6 6 6 6 5 5	5 5 5 5 2 5 5 3 1 4 3 3
4 5 6 6 4 4 5 4 7 3 5 5	5 5 5 5 1 4 5 4 5 3 2 5
5 5 5 5 5 6 5 5 5 5 5 4	5 5 5 2 4 5 5 5 5 5 5 4
6 5 6 4 6 5 5 5 5 6 5 5	4 5 5 5 5 3 4 5 4 5 5 5
5 5 5 4 6 6 4 6 3 4 6 4	4 2 5 4 2 5 5 4 5 3 2 4

5 6 6 6 6 5 6 6 4 5 6 6 4

5 5 4 5 5 5 6 4 4 5 3 4 4 4 5 4 4 5 6 4 5 5 6 6 4 5 4 5 6 6 4 4 7 2 6 4 6 6 6 5 5 6 5 5 6 6 4 5 7 5 6 5 6 4 5 5 6 7 5 4 5 5 6 3 5 5 3 5 4 5 4 4 5 5 6 5 6 6 6 6 5 5 5 6 5

6 7 4 5 7 6 7 7 6 6 3 5 4 5 5 4 6 5 3 5 6 7 3 6 7 7 4 6 6 5 5 4 7 5 5 5 7 6 4 5 7 5 5 4 7 6 4 5 7 6 5 5 7 6 4 4 6 6 3 4 6 7 5 4 7 5 3 5 5 5 3 2 6 7 7 7 7 6 7 5 6 7 7 7 6

6 4 2 2 5 5 3 2 4 6 3 3 4 1 2 2 5 4 3 3 4 6 2 3 3 3 2 3 4 3 3 1 5 4 3 2 5 5 4 2 3 4 5 4 5 3 2 4 5 4 6 2 4 2 4 2 4 3 2 2 3 5 3 1 6 3 2 3 2 1 4 1 5 6 6 3 3 3 7 6 3 6 3 6 7

6 5 5 5 7 5 6 5 6 7 2 4 5 5 5 5 5 5 5 5 4 5 5 5 4

5 2 5 3 5 5 1 4 5 5 1 5 5 5 5 5 5 5 5 5 4 5 3 5 5 5 5 5 5 5 5 5 5 5 5 2 5 5 5 5 5 5 5 5 5 5 5 5 5 4 4 5 5 5 5 1 4 2 5 4 4 5 5 4 5 3 5 4 5 5 5 1 5 5 5 5 5 5 5 5 5

5 5 5 3 5 4 1 3 5 5 1 5 5 5 5 5 2 5 5 5 5 5 3 5 5 5 3 1 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 4 4 5 4 5 5 5 4 2 5 4 4 5 5 4 4 5 2 4 5 5 5 5 4 5 5 5 5 5 5 5 6

5 1 4 3 4 4 5 5 5 5 1 4 5 1 5 5 1 5 5 5 5 4 5 4 5 5 5 5 2 5 4 5 5 5 5 5 5 5 5 5 5 5 4 5 5 5 5 5 5 5 5 5 5 5 5 3 3 5 5 5 5 5 4 1 5 3 5 2 5 3 4 1 2 4 5 5 5 5 5 5 5 5 5 5 5 5 7

5 5 5 3 5 5 1 3 5 5 3 5

5	6	6	6	5	6	5	4	7	7	5	7	3	4	5	5
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10												10			
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8															
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4	5	5	5	5	5	5	5	5	5	5	5				
9															
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10															
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6 7 7 7 7 6 7 7 5 5 7 7

11

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5 5 7 1 5 5 5 6 5 5 4 2
4 5 5 3 6 4 1 5 3 4 2 4
5 5 7 7 6 7 7 6 3 5 5 7

12

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13

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11

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13

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14

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15

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16

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16

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18

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APPENDIX E. Additional Results

Group by Error by Talker Scores

Affective Reaction

G = 1	T = 1	2
E = 1	5.31884	4.26812
2	5.23188	4.58696
3	5.34058	4.32609
4	5.38406	4.67391
5	5.54348	4.26087
6	4.92754	3.78261
7	5.40580	5.78986

G = 2	T = 1	2
E = 1	5.72464	4.68116
2	5.47826	5.13043
3	5.52899	4.54348
4	5.54348	5.13768
5	6.09420	4.60870
6	5.04348	4.08696
7	6.01449	6.26812

G = 3	T = 1	2
E = 1	5.02174	4.84783
2	5.70290	5.19565
3	4.89130	5.06522
4	5.34058	5.10145
5	4.85507	5.04348
6	4.67391	4.49275
7	6.36957	5.33333

G = 4	T = 1	2
E = 1	4.74638	4.40580
2	5.44928	4.74638
3	4.47826	4.50725
4	5.12319	4.46377
5	4.52899	5.18841
6	4.05072	3.92754
7	5.94203	5.54348

Comprehensibility

G = 1	T = 1	2
E = 1	4.40580	3.50000
2	3.92754	4.31159
3	4.48551	4.76087
4	4.85507	4.86957
5	4.34783	4.63768
6	3.60870	3.89855
7	4.71739	4.84783

G = 2	T = 1	2
E = 1	4.50725	3.23188
2	4.23913	4.18841
3	4.29710	4.66667
4	4.77536	4.76812
5	4.23188	4.68116
6	3.69565	3.86232
7	4.71739	4.91304

G = 3	T = 1	2
E = 1	3.09420	4.34783
2	4.03623	4.13768
3	4.75362	4.42754
4	4.97826	4.74638
5	4.76087	4.42754
6	4.29710	3.40580
7	4.98551	4.76087

G = 4	T = 1	2
E = 1	3.31159	4.45652
2	3.83333	4.25362
3	4.72464	4.50725
4	4.89130	4.80435
5	4.77536	4.47826
6	4.32609	3.53623
7	4.98551	4.85507

Subject by Error Interaction Scores - Affective Reaction

G = 1 S =	E = 1	2	3	4	5	6	7
1	4.75000	4.75000	4.58333	5.50000	5.33333	4.16667	6.16667
2	4.50000	4.58333	4.75000	5.00000	4.58333	4.66667	5.33333
3	5.16667	5.41667	4.83333	5.00000	5.25000	4.83333	5.58333
4	4.58333	4.83333	4.75000	5.41667	5.41667	4.50000	5.50000
5	5.75000	4.91667	5.50000	5.41667	5.25000	4.75000	6.58333
6	3.75000	3.25000	3.00000	3.83333	3.33333	2.83333	4.75000
7	5.25000	5.75000	5.33333	5.33333	5.25000	4.83333	6.25000
8	4.41667	3.33333	4.00000	4.33333	3.33333	3.33333	5.00000
9	5.33333	5.33333	5.33333	5.16667	5.16667	5.08333	5.41667
10	6.25000	6.50000	6.16667	6.33333	6.08333	6.00000	6.50000
11	4.08333	5.25000	5.25000	5.66667	4.58333	3.83333	5.83333
12	5.08333	5.41667	5.00000	5.00000	4.75000	4.50000	5.16667
13	4.08333	4.41667	3.75000	4.50000	3.83333	3.33333	5.00000
14	5.33333	5.66667	5.75000	5.41667	5.41667	5.16667	6.08333
15	3.58333	4.16667	4.33333	4.00000	4.50000	3.00000	5.25000
16	6.16667	5.83333	6.41667	6.16667	5.91667	5.66667	6.83333
17	5.91667	5.83333	6.25000	6.08333	6.25000	5.50000	6.91667
18	4.75000	5.41667	4.41667	4.75000	5.16667	4.16667	5.91667
19	4.41667	4.33333	4.00000	4.41667	4.50000	4.08333	4.41667
20	3.08333	3.16667	3.41667	3.16667	3.33333	2.91667	3.91667
21	3.66667	4.16667	4.00000	4.50000	4.41667	3.58333	5.08333
22	5.66667	5.83333	5.66667	5.91667	6.33333	5.25000	6.41667
23	4.66667	4.75000	4.66667	4.75000	4.75000	4.16667	4.83333

G = 2 S =	E = 1	2	3	4	5	6	7
1	4.25000	5.00000	4.16667	4.83333	4.33333	3.16667	5.25000
2	5.66667	5.50000	5.00000	5.41667	5.16667	4.75000	6.66667
3	5.58333	5.58333	4.83333	5.50000	5.41667	4.66667	7.00000
4	5.16667	5.50000	5.00000	5.25000	5.33333	4.75000	5.91667
5	4.83333	5.00000	4.50000	4.66667	4.50000	4.33333	5.75000
6	4.41667	4.08333	3.58333	4.08333	4.83333	3.08333	5.75000
7	5.00000	5.08333	4.50000	4.91667	4.66667	3.41667	5.83333
8	3.91667	5.16667	4.08333	5.16667	5.16667	4.00000	6.08333
9	4.00000	5.00000	4.16667	4.08333	4.25000	3.33333	5.66667
10	5.41667	5.08333	5.50000	5.25000	5.66667	4.58333	6.83333
11	4.16667	4.75000	4.33333	4.08333	4.66667	4.08333	5.83333
12	5.33333	5.58333	5.66667	5.58333	5.25000	4.58333	6.58333
13	4.33333	4.33333	4.00000	4.16667	4.33333	4.16667	4.41667
14	5.41667	5.33333	5.50000	5.41667	6.08333	4.83333	6.66667
15	6.25000	6.66667	6.58333	6.16667	6.16667	5.58333	6.91667
16	6.08333	5.66667	5.25000	6.33333	6.00000	5.33333	6.08333
17	4.25000	4.25000	3.66667	4.91667	4.50000	3.41667	6.16667
18	5.25000	5.33333	5.16667	5.66667	5.58333	4.25000	6.16667
19	5.66667	4.91667	5.50000	6.08333	5.91667	4.75000	6.16667
20	6.00000	6.08333	5.91667	5.83333	6.08333	5.83333	6.58333
21	6.08333	5.25000	5.83333	6.25000	6.16667	5.66667	6.25000
22	6.16667	6.16667	6.50000	6.33333	6.41667	6.25000	6.00000
23	6.41667	6.66667	6.58333	6.83333	6.58333	6.16667	6.66667

G = 3 S =	E = 1	2	3	4	5	6	7
1	4.58333	6.16667	4.83333	5.41667	4.66667	5.16667	6.33333
2	4.41667	4.75000	4.33333	4.75000	4.58333	4.50000	4,83333
3	4.91667	5.58333	4.91667	5.33333	5.16667	4.16667	5.75000
4	3.91667	4.41667	3.66667	4.91667	4.25000	3.50000	6.08333
5	5.58333	6.50000	6.16667	6.16667	6.16667	6.16667	6.41667
6	3.41667	4.25000	3.58333	3.66667	3.33333	3.08333	4.33333
7	5.50000	6.25000	6.00000	5.91667	6.08333	5.25000	6.58333
8	5.25000	6.08333	5.50000	5.83333	5.50000	5.66667	6.00000
9	5.00000	4.75000	3.91667	4.25000	3.75000	3.75000	4.16667
10	5.16667	5.75000	5.75000	5.75000	5.25000	5.08333	5.83333
11	5.33333	5.83333	5.50000	5.66667	5.41667	5.16667	5.58333
12	4.91667	5.91667	5.33333	5.41667	5.33333	5.00000	6.25000
13	5.41667	5.83333	5.83333	6.16667	5.83333	5.33333	6.66667
14	4.16667	4.91667	4.33333	4.33333	3.50000	3.58333	5.50000
15	4.75000	4.58333	4.91667	4.58333	4.41667	4.33333	5.58333
16	5.00000	5.16667	4.25000	5.16667	4.66667	3.50000	6.33333
17	5.50000	5.91667	5.08333	5.16667	4.66667	4.33333	6.91667
18	5.58333	5.83333	5.75000	5.91667	5.91667	4.58333	6.58333
19	6.00000	6.33333	5.75000	5.91667	6.00000	5.75000	6.41667
20	4.83333	5.25000	4.91667	5.00000	5.16667	4.83333	5.58333
21	3.75000	3.83333	3.50000	4.66667	3.83333	3.41667	5.08333
22	5.41667	5.91667	5.33333	5.25000	5.33333	4.91667	6.08333
23	5.08333	5.50000	5.33333	4.83333	5.00000	4.33333	5.66667

G = 4 S =	E = 1	2	3	4	5	6	7
1	5.16667	5.58333	4.75000	5.41667	5.75000	4.41667	6.50000
2	4.66667	5.75000	5.16667	4.50000	4.91667	3.66667	6.41667
3	3.91667	4.83333	3.41667	3.58333	4.08333	2.91667	6.83333
4	5.25000	5.08333	4.50000	5.33333	5.50000	4.41667	6.50000
5	5.08333	5.75000	4.50000	5.08333	4.91667	4.08333	6.58333
6	4.33333	5.16667	4.08333	4.83333	4.58333	3.16667	6.08333
7	4.58333	4.91667	4.50000	4.75000	4.33333	3.75000	5.41667
8	4.91667	5.25000	4.91667	4.83333	4.83333	4.66667	5.50000
9	5.08333	5.66667	5.33333	5.16667	5.16667	4.83333	6.33333
10	4.58333	4.16667	4.00000	5.00000	4.58333	3.83333	5.16667
11	4.41667	4.58333	4.41667	4.50000	4.91667	4.00000	5.00000
12	3.83333	4.25000	3.91667	4.08333	4.16667	3.41667	4.33333
13	4.25000	4.50000	3.58333	4.33333	4.58333	3.25000	5.33333
14	4.50000	5.83333	4.75000	5.41667	5.50000	4.16667	6.08333
15	4.83333	4.83333	4.41667	4.91667	4.75000	4.41667	5.16667
16	5.75000	6.25000	6.16667	6.25000	5.50000	5.83333	6.50000
17	3.75000	4.83333	3.83333	5.08333	5.25000	3.58333	4.91667
18	5.25000	5.66667	5.50000	5.33333	5.58333	4.91667	5.50000
19	4.08333	4.41667	4.16667	3.83333	4.33333	3.00000	5.66667
20	3.33333	4.58333	3.66667	4.41667	4.25000	2.91667	4.58333
21	4.08333	4.41667	3.91667	4.00000	4.41667	3.41667	6.41667
22	4.91667	5.75000	4.91667	4.91667	4.75000	4.41667	5.83333
23	4.66667	5.16667	4.91667	4.66667	5.08333	4.66667	5.41667